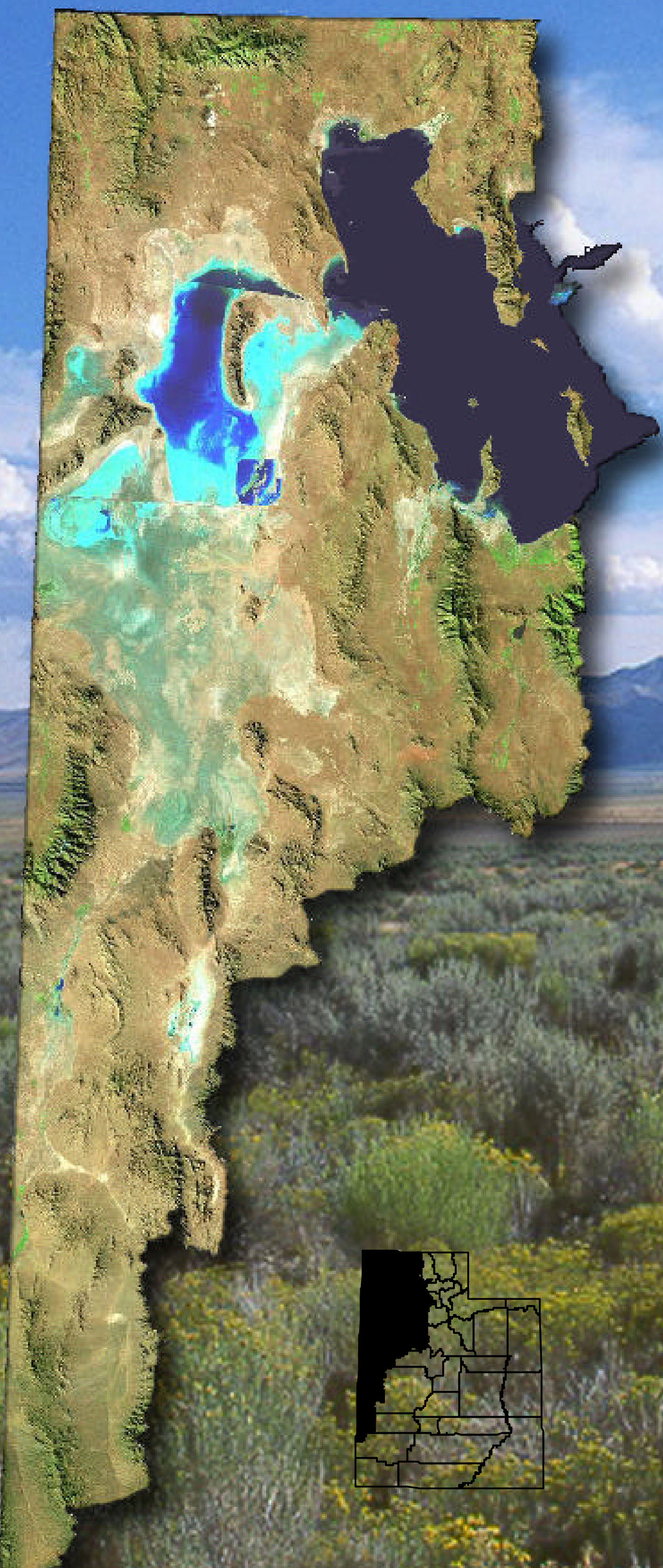
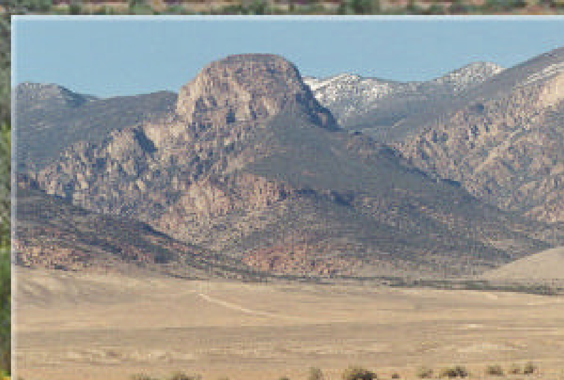
Utah State Water Plan
WEST DESERT BASIN

Division of Water Resources

April 2001





STATE OF UTAH
NATURAL RESOURCES
Division of Water Resources

Utah State Water Plan - West Desert Basin

Section

Utah State Water Plan
West Desert Basin

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May 2001

Utah Division of Water Resources
Utah Department of Natural Resources

Section 1

West Desert Basin

Utah State Water Plan

Foreword

Utah's *State Water Plan*, prepared and distributed in 1990, provides the foundation and overall direction for state water management and policies. It established policies and guidelines for statewide water planning, conservation and development. As a part of the state water planning process, more detailed plans are prepared for each of the hydrologic basins within the state. The West Desert Basin Plan is the eleventh and final of such reports. This plan covers all aspects of Utah's water resources in the West Desert Basin which includes western Box Elder County, Tooele County and the western portions of Juab, Millard, Beaver, and Iron counties. It identifies alternative ways to solve problems and meet demands. Final decisions on selecting alternatives for implementation will be made by local decision-makers.

The West Desert Basin Plan provides valuable water-related public information, encourages community and economic growth, provides opportunity for local, state and federal cooperation, identifies water supplies and needs, and promotes local involvement in water planning. Planning requires the active participation of people who have a stake in how the plan is carried out. If the voices of local and regional public entities and individuals are heard in the early stages, there will be broader support for actions recommended in the plan.

1.1 ACKNOWLEDGMENT

The Board of Water Resources gratefully acknowledges the dedicated efforts of the State Water Plan Coordinating Committee and Steering Committee in preparing the West Desert Basin Plan. Work was led by the planning staff of the Division of Water Resources, with valuable assistance from individual coordinating committee members representing state agencies with water-related missions. Their standards of professionalism and dedication to improving Utah's natural resources base are essential ingredients of this basin plan.

We also appreciate input from representatives of local, state and federal cooperating entities and especially the local West Desert Basin Plan planning advisory group. Individuals from these entities provided a broad spectrum of expertise from a wide variety of interests.

In addition, we extend a sincere thanks to the people who attended meetings throughout the basin and provided oral and written comments to the West Desert Basin Plan. Public input is imperative in the water planning process if a successful state water plan is to be obtained.

In endorsing this plan, as with previous basin plans, we reserve the right to consider individual water projects on their own merits. This basin plan is an important guide for water development in the West Desert Basin.

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Section 2

West Desert Basin

Utah State Water Plan

Executive Summary

2.1 FOREWORD

The State Water Plan provides a foundation for state water policy. This helps the state meet its obligation to plan and implement programs to best serve the needs of the people. This is the last of the detailed basin plans associated with the State Water Plan. Plans have already been completed for the other 10 basins of the state: Bear River, Cedar/Beaver, Kanab Creek/Virgin River, Weber River, Jordan River, Utah Lake, Sevier River, Uintah, West Colorado, and Southeast Colorado hydrologic basins. These plans have all been prepared under the direction of the Board of Water Resources.

2.3 INTRODUCTION

The main purpose of this basin plan is to inventory existing resources, assess existing conditions, identify problems and issues and describe potential development alternatives for meeting the water needs of future generations. The State Water Plan and individual river basin plans can provide guidance and help coordinate the planning efforts among all state, federal and local entities. The West Desert Basin Plan is prepared at a reconnaissance level, with a general assessment of problems and needs. The preparation of this plan has involved many local, state and federal entities who have expertise regarding water resources.

The West Desert Basin is located in the northwest corner of the state and extends along the Nevada state line, into the southern portion of the state (Figure 3-1). It is bounded to the east by the Bear River Basin, the Weber River Basin, the Jordan River Basin, the Utah Lake Basin, the Sevier River Basin and to the south by the Cedar/Beaver Basin. Included in this report is the Columbia River Basin, 393 square miles in the extreme northwest corner of the state which drains via Goose Creek north and into the Snake River.

> This section summarizes the 19 sections of the West Desert Basin Plan. The plan contains 19 sections and is modeled after the State Water Plan (1990). In addition, it contains Section A; Acronyms, Abbreviations and Definitions, and Section B; Bibliography.

The West Desert Basin, including the Great Salt Lake, comprises roughly 11.7 million acres, or approximately 22 percent of the state's total area. By contrast, it is home to just over 38,500 residents or about 1.8 percent of the state's total population. Approximately 88 percent of the basin's population, or roughly 33,860 people, reside on 7 percent of the basin's land, in Tooele and Rush valleys. The remaining nearly 4,660 residents of the basin reside on the remaining 93 percent of the basin's land at a population density of approximately one resident per 6 square miles.

The West Desert Basin consists primarily of broad arid valleys separated and bounded by a series of mountainous regions. These mountains serve as catchment areas for precipitation in the form of snow in the winter and rain at other times of the year, providing the desert valleys with intermittent and ephemeral streams. Although many streams flow perennially in the mountain canyons, only a few, such as Blue Creek in Box Elder County, flow year round once they reach the desert valleys. Several agricultural communities have developed and even flourished in the desert valley environments through prudent use of the limited groundwater and surface water supplies.

The salinity of the Great Salt Lake has rendered it of little value for municipal, agricultural, or most other uses. Mineral extraction industries around the Great Salt Lake, however, provide hundreds of jobs and represent millions of dollars to the Utah economy. The brine shrimp industry also provides significant jobs and considerable economic benefits to the state. In addition to these economic values, the Great Salt Lake is a unique environmental habitat, visited by millions of migratory birds annually, and home to many thousands of birds and other wildlife living in the approximately 250,000 acres (including wetlands in the Jordan and Weber river basins) of wetlands presently existing around the lake. Despite its size the Great Salt Lake is sensitive to pollution. The primary issues currently affecting the Great Salt Lake are:

- The impact upon wetlands and bird habitat by encroaching development;
- Unbalanced salinity levels between the north and south arms of the lake;
- Reduced brine shrimp populations due to the salinity imbalance, and;
- Uncontrolled flow of nutrients and toxic pollutants into a lake that essentially has no water quality standards established to safeguard its water quality.

2.4 DEMOGRAPHICS AND ECONOMIC FUTURE

The West Desert Basin is one of the most sparsely populated areas- - not only of Utah but of the Intermountain West. Tooele City, with an estimated current population of just over 20,000 people, is the largest city in the basin and Grantsville is the second most populous with nearly 6,000.

Much of the terrain throughout the basin is either too rugged, too dry or too saline to attract large numbers of settlers or entrepreneurs. Aside from the Tooele Valley, which, since the last decade has experienced significant growth, it is unlikely the basin will see large population increases in the foreseeable future. In 1996, just under 32,000 people were permanent residents in the basin. This is expected to increase to 38,500 by 2000, and to about 68,200 by 2020. This is an increase of almost 36,500 people or roughly 115 percent. The annual rate of population growth is approximately 2.8 percent.

The basin’s employment base is centered in Tooele Valley and in the salt, mineral and brine related industries located near the Great Salt Lake. Agriculture in Tooele County is expected to lose jobs gradually, while mining jobs will increase slowly. Construction, manufacturing, TCPU (transportation - communication and public utilities) and government jobs will all increase between 30 percent and 60 percent by the year 2020. High growth sectors for the same period are trade (78 percent), FIRE (finance, insurance and real estate) (73 percent), services (106 percent), and non-farm proprietors (91 percent).

As in most areas of the state, service and trade sectors will be the leading sources of jobs with government employment growing at about the rate of population increases. Industries located on the Great Salt Lake are expected to continue providing employment to Wasatch Front and West Desert basin residents.

2.5 WATER SUPPLY AND USE

The West Desert Basin includes some of the most arid lands in the western United States. Surface water sources are scarce and most often intermittent. Consequently, residents of the basin have come to rely heavily upon groundwater resources. Although surface water sources have been developed for agricultural uses, municipalities have come to rely exclusively upon groundwater supplies.

The Great Salt Lake receives a total annual inflow of just over 3.5 million acre-feet. The West Desert Basin contributes just 2 percent of that total (54,000 acre-feet), primarily in the form of sub-surface flow (See Table 5-4). The largest contribution to the Great Salt Lake comes from the Bear River basin, just over 40.5 percent or 1.45 million acre-feet. Direct precipitation on the lake adds 1.0 million acre-feet or 28 percent of the annual inflow, while the Weber River contributes 18 percent (640,300 acre-feet) and the Jordan River adds 12 percent (438,000 acre-feet) of the Great Salt Lake's annual inflow.

Tooele Valley and Great Salt Lake

All of the basin's community water systems obtain their culinary water supplies exclusively from groundwater sources (See Table 5-5). The public community water systems for Juab and Millard counties obtain water from wells, while Box Elder and Tooele counties' communities have a mix of well and spring sources for their municipal and industrial water supplies. The basin's community water systems have a total available water supply of 25,870 acre-feet per year. Non-community water systems provide an additional 490 acre-feet per year, while self-supplied industrial sources have 3,760 acre-feet per year. Private domestic systems are estimated to provide users with 690 acre-feet per year. This puts the total municipal and industrial water supply in the West Desert Basin at 30,810 acre-feet per year.

The total culinary use from the basin's community water systems is 7,080 acre-feet per year, or less than a third of the existing M & I water supply. For most communities in the basin the limiting factor is not the existing water supply, but the water system's capacity.

Agricultural use is the largest single use of fresh water in the West Desert Basin. It is estimated that 181,700 acre-feet of water is used to irrigate 78,770 acres. This is about 2.4 acre-feet per acre and an indication that there are significant water shortages in the agricultural sector. Typically throughout the basin the allocated water right is 4 acre-feet per acre.

2.6 MANAGEMENT

Management is the responsibility for control, augmentation and use of a water supply, including diversion, transmission, treatment, storage, distribution and control of use. As was true in most other areas of the state, water supplies in the early years of settlement were managed by bishops of the Church of Jesus Christ of Latter-day Saints. Later, irrigators organized irrigation companies to manage the water resources. Culinary water systems were established soon after settlement to meet domestic needs. They now operate under guidelines established by federal regulations and state rules administered by the Division of Water Rights and the Division of Drinking Water.

In 1869 the Southern Pacific Railroad constructed Rosebud Reservoir south of Park Valley. This was the first of twenty-four reservoirs constructed in the basin. Most of these reservoirs are used today to store irrigation water, but other uses include wildlife habitat, flood control and tailings storage. See Table 6-1 for a list of the basin's reservoirs and Figure 6-1 for their locations.

Incorporated mutual irrigation companies serve the majority of irrigated land in the basin. Only 30 of the companies listed in the Division of Water Right's publication, *Water Companies* *in Utah*, have service areas exceeding 100 acres (See Table 6-2).

The Great Salt Lake provides hundreds of jobs and brings millions of dollars into the Utah economy through the mineral extraction and brine shrimp industries. At the same time, the Great Salt Lake provides a unique environmental habitat for many millions of migratory birds as well as many thousands of resident birds and other wildlife that inhabit the 250,000 acres of wetlands along the lake shoreline. The competing interests of wildlife and industry make management of the lake a complicated issue. On March 1, 2000 the Utah Department of Natural Resources published the Great Salt Lake Comprehensive Management Plan and Decision Document. This document reflects the input of many state agencies and establishes the guidelines for the future management of the Great Salt Lake.

Between 1983 and 1987, the Great Salt Lake, in response to record rainfalls and unseasonable cool and wet springs, rose dramatically to a historic record high elevation of about 4212 feet above MSL.

The high water flooded wastewater treatment facilities, power lines, dikes and wetlands at the wildlife refuges, and private duck clubs, as well as dikes and evaporating ponds at many commercial mineral extraction facilities along the lake's shoreline. The high water also threatened freeways, railway lines, additional wastewater treatment facilities, and power lines, and caused further damage to the already impacted mineral mining companies and wildlife facilities around the lake.

In an effort to reduce the flooding around the lake, the state breached the railroad causeway on August 1, 1984. The lake was so high, however, that breaching was viewed as an interim measure until a more permanent solution could be found. Between 1984 and 1986 many alternatives were investigated in order to determine the best way to address the continued rise of the Great Salt Lake. The West Desert Pumping Project was constructed on the western shore of the lake and delivered water to the diked New Foundland Evaporation Pond in the west desert. Great Salt Lake water was pumped into the west desert from May of 1987 through June of 1989. During that period of time the project lowered the lake approximately 26 inches. Today the pumps remain in place as insurance to reduce the impact of flooding should the Great Salt Lake again rise to elevations similar to those of the mid '80s.

2.7 REGULATION/INSTITUTIONAL CONSIDERATIONS

State agencies are required by law to provide administrative control and regulatory authority over the state's water resources. The State Engineer, as Director of the Division of Water Rights, has responsibility for administering water rights and for dam safety. Currently, there are three dams, Blue Creek, Grantsville, and Settlement Canyon that are rated high hazard, not because of their condition but because of the potential to cause loss of life and considerable property damage if they failed.

Settlement Canyon Reservoir

Water quality regulations are administered by the Water Quality Board and the Drinking Water Board within the Department of Environmental Quality. The Utah Water Quality Board has developed rules, regulations, policies and planning processes necessary to prevent, control and abate new or existing pollution of surface water and groundwater. These are carried out by the Department of Environmental

Quality, Division of Water Quality. The Division of Drinking Water serves as staff for the Drinking Water Board to assure compliance with federal regulations and state rules.

Other entities also have responsibilities for regulating and managing certain aspects of the water resources. These include mutual irrigation companies, water conservancy districts, special service districts, drainage districts, cities and towns. These entities can levy taxes and assessments for maintenance and operation of their facilities.

2.8 WATER FUNDING PROGRAMS

Funding has always been an important part of water resource development. In Utah's early years, individuals, private irrigation companies and the Church of Jesus Christ of Latter-day Saints worked together to develop water facilities. Today, private citizens still play an important role in funding water development projects. The federal and state governments have developed numerous programs which make grants and low-interest loan money available for water development. Many of these funding programs require up-front cost-sharing from individuals, groups or entities receiving benefits from the projects or complete repayment of revolving loan funds.

2.9 WATER PLANNING AND DEVELOPMENT

Water development began with the first settlements of pioneers in the late 1840s. In 1847 and 1848 prior to any settlement, Tooele and Rush valleys were used as a herd ground for cattle. In September of 1849, the first white settlers came into Tooele Valley and settled south of the present site of Tooele. Settlement in the Grantsville area started the following year. Over the course of the next few decades, settlements were established throughout the Tooele and Rush Valleys as well as other areas of the basin: Snowville, Park Valley and Grouse Creek to the north, Callao to the south, and later Wendover to the west. Except for Wendover, these communities were located in valleys where mountain streams could be developed for irrigation use. During the same period of time, wells were dug to provide culinary water for the settlements. Over the years, the Board of Water Resources has provided technical assistance and funding for 53 projects in the West Desert Basin totaling just over $13.2 million.

Despite the basin's limited water resources, the M&I water supplies for most communities are adequate to meet not only today's needs but the projected needs through 2020. This is because of the relatively small populations and because water purveyors have acquired adequate groundwater rights to provide for future M&I water needs. Even where water supplies are short, (Erda, Lincoln, Vernon, the S&W Trailer Park and the Goshute Indian Reservation) adequate supplies are available either through development of new sources, or the purchase of existing rights.

Although most of the basin's community water systems have an adequate water supply through the year 2020 many do not have sufficient carrying capacity to deliver the demand that is projected for the year 2020. Except for Dugway, Stockton and Wendover, all of the Tooele County community water systems have insufficient system capacity to meet the 2020 demand. The Goshute Indian Reservation also has inadequate system capacity to meet the 2020 demand. The community water systems in Box Elder County (Grouse Creek, Howell, and Snowville) and the Eskdale Community Water System in Millard County all have sufficient capacity for their 2020 demand.

Residents in Snowville and Curlew Valley have expressed concern that development in the northern end of the valley, in Idaho, will reduce groundwater supplies. An estimated 20,000 acre-feet of groundwater flows annually across the state line from Idaho into the Utah portion of Curlew Valley. Without some type of agreement between the states as to how to handle this problem, this concern could become a serious issue.

Residents of Eskdale have expressed a concern that developers in southern Nevada have shown interest in tapping into unused groundwater supplies in Snake Valley. Their concern is that mining of the Creek Valley groundwater could leave them with lowered water levels in their wells and reduced water quality.

Growth over the past few years has taxed Tooele city's existing supplies and raised concerns about meeting the future water needs. A couple of recent developments, however, have brightened Tooele City's future water supply outlook. The city acquired the culinary water supplies of the recently closed Tooele Army Depot. Also, Tooele City has drilled three new and highly productive wells. These developments have resolved the city's water supply problems for the present and immediate future. Tooele City will still need to address its inadequate system capacity at some time in the near future.

Irrigation water use has remained stable over recent years. Although there is a significant amount of undeveloped arable land in the basin, development of new irrigated lands has been limited by the short supply of surface water, particularly in the late season. Currently, irrigated land within the basin is 78,770 acres. This is projected to change very little by the year 2020. One exception will be in the Tooele/Rush Valley area where population increases will reduce the amount of existing agricultural land, and likely result in some agricultural water supplies being converted to municipal and industrial uses.

The total per capita municipal and industrial water use (potable and non-potable) in the West Desert Basin is 260 gallons per person per day compared to the statewide average of 320 gallons per person per day.

The basin's projected population for the year 2020 is 61,850 people. Based upon the current average, the basin will need a total municipal and industrial water supply of 18,010 acre-feet per year in 2020. This is well within the basin's existing total municipal and industrial water supply of 30,810 acre-feet/year. For the county of Tooele, the projected population for the year 2020 is 59,680 people. Based upon Tooele County's average M&I use of 255 gallons per person per day, Tooele County will need 17,050 acre-feet per year in 2020. This is well within the county's existing M&I supply of 28,550 acre-feet per year.

Although water is scarce in the West Desert Basin there are still developable groundwater and surface water sources throughout much of the basin. The exceptions are Tooele Valley and the Snowville area which have been closed to the further appropriation of surface and groundwater. Any development of new surface water will likely mean the construction of a small reservoir to store springtime runoff. Although the basin does not have any large potential reservoir sites there are likely many locations where, if economically feasible, several hundred acre-feet of water could be captured and stored.

There is potential to stretch existing water supplies through a number of conservation practices. Water users may be able to better manage their supplies thereby increasing efficiencies which in turn can reduce costs. This applies to all water uses including residential, commercial, industrial and agricultural.

Weather modification or cloud seeding, has long been recognized as a means to enhance existing water supplies. There are two winter time cloud seeding projects using silver iodide in the West Desert Basin. The West Box Elder project which targets the watersheds of the Raft River Mountains, operated for 9 years from 1989 to 1997. The project was started again in the year 2000. A project in East Tooele County, targeting the watersheds of the Stansbury and Oquirrh Mountains, has operated for 16 years. The project operated from 1976 to 1983, 1989 to 1992 and 1996 to the present. Runoff analysis in

Utah indicates a 10 percent increase in April 1 snow water content will result in a 10 to 20 percent increase in the April-July runoff depending on individual watersheds.

2.10 AGRICULTURAL

Throughout the West Desert Basin, the greatest limitation to agricultural development and production has been the availability of water. There are approximately a million acres of arable land in the basin. Most of that land is not being cultivated because of the limited water supply.

Agriculture is a major industry in the basin and as such it has a direct impact on the economy of the area. Spinoff from agriculture helps support employment and production in other sectors along with providing economic diversity.

Historically, agriculture has played a key role in the basin's economy. While agriculture continues to be a significant source of income throughout much of the basin, Tooele Valley and Wendover have come to rely upon service and industry related jobs to fuel their economies. The close proximity of Tooele Valley to populated Salt Lake City has created a suburban type settings with many residents commuting to work in service or industry related fields. Still, even in these suburban areas, agricultural water use plays an important role in overall water planning, both in terms of quantity and quality. In many of the basin's smaller communities--from Snowville, Park Valley, and Grouse Creek in the north, to Callao, Partoun, Eskdale, and Garrison in the south--agricultural water is a key element to economic survival.

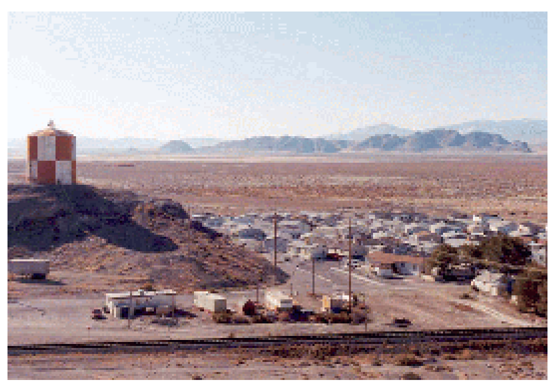
The majority of irrigated lands are used for the production of feed for cattle. Irrigated pasture land accounts for 30 percent, while alfalfa makes up 34 percent, of the irrigated ground. Various grains, corn and hay, as well as idle and fallow ground make up much of the remainder.

Today there are 78,770 acres of irrigated crop land within the basin, and just over 123,700 acres of dry-cropland. Approximately 178,000 acre-feet of water is diverted each year to irrigate the basin's 78,770 acres of irrigated ground. It is estimated that almost 108,000 acre-feet of the diverted water is depleted. Less than a tenth of one percent of the irrigated ground is used to produce high cash crops such as fruits and vegetables.

2.11 DRINKING WATER

Because of the limited surface water supply, towns and isolated residents throughout the basin are dependent upon groundwater for culinary water supplies. Public drinking water supplies throughout the basin come principally from wells (79 percent) and to a lesser extent from springs (21 percent). There are no surface water treatment plants in the basin. It is anticipated that new drinking water sources in the foreseeable future will come from groundwater supplies, either wells or springs, since they are more reliable and less expensive to develop than surface water sources and generally do not require the expensive treatment processes that surface waters do.

There are currently 18 community water systems in the West Desert Basin. There are an additional 18 non-community water systems. The basin's community water systems have a collective supply of 25,870 acre-feet/year. The basin's non-community water systems provide an additional 490 acre-feet of potable water annually.



Water tank on the outskirts of Wendover

For much of the basin, growth does not loom as a serious problem. This is particularly true for the small rural communities where growth in recent years has been slight to non-existent. For many of these areas, even a doubling of the population would not represent a significant increase in the number of people. In Tooele Valley and Wendover, however, relatively high growth rates are expected. Fortunately, the county and city planners in these areas have already addressed the issue. Wendover, Utah, and West Wendover, Nevada, have addressed the issue jointly and have developed well and spring sources sufficient to supply their culinary water needs through 2020.

Tooele County has addressed the issue of growth in its Tooele County General Plan, November 1995, which projects adequate water supplies through the year 2020. The city of Tooele will be the most significantly impacted community, with its population projected to double by the year 2020. For some time, city planners were concerned about their ability to meet the water needs of such growth. But the recent addition of three successful new wells along with the purchase of existing water rights have dramatically improved Tooele city's water supply for the present and immediate future. As the year 2020 approaches however, Tooele city's population will again approach the limits of the city's water supply if additional water sources are not obtained. The data show nearly every community water system in the basin has adequate supplies to meet future needs through 2020. The exceptions in Tooele County are Lincoln Culinary Water and Erda Acres Water Company. Outside of Tooele County, the only community with an inadequate supply for their 2020 population projection is the Goshute Indian Reservation.

2.12 WATER QUALITY

There are 12 wastewater treatment plants in the basin. These are shown in Table 12-1. At the present time the Tooele Wastewater Treatment Plant discharges about one million gallons per day to an irrigation ditch. Plans are in place, however, to upgrade the treatment plant's efficiency, and in the near future use the effluent for irrigation at a local golf course.

The state agency charged with the responsibility to regulate water quality is the Utah Division of Water Quality within the Utah Department of Environmental Quality. Historically, water quality has been under jurisdiction separate from water quantity and the Division of Water Rights.

The West Desert Basin is free of any really significant water quality problems. Surface water streams arise in the mountains and remain relatively free of natural and man caused pollution to the point at which they are diverted for agricultural use. Groundwater tends to be high in TDS near the Great Salt Lake, but near the mountain benches where there is significant recharge, groundwater quality is generally good to excellent.

The basin's stream channels below the points of diversion are often dewatered or can have a high salinity problem. Some riparian areas have been degraded but there is not a lot of man caused water quality impacts within the basin.

2.13 DISASTER AND EMERGENCY RESPONSE

The history of water-related natural disasters in the West Desert Basin includes few significant floods or drought events. The sparse population has not encroached upon the natural waterways or taxed existing water supplies to the point that flooding or droughts have become a reoccurring problem. The floods of the mid-1980s, however, resulted in millions of dollars in property damage to businesses, public utilities and infrastructure. But these flooding problems were primarily associated with the rising level of the Great Salt Lake and the impact upon the lake's surrounding industries, roadways and railroad. Local flooding throughout the basin during that period was primarily due to elevated groundwater tables and an increase in artesian pressure. The extended drought years of the late 1980s lowered reservoir storage levels significantly, and in some instances prompted consideration of restrictions for outdoor water use. But for the most part, the basin does not have as great a threat of flooding or drought as is found in much of the rest of the state. In spite of this basin's relatively low likelihood for natural disasters, the various counties of the basin currently have an existing policy to preserve rights-of-way over existing natural drainage ways to ensure that flood plains remain free of development.

Thunderstorms are common during the summer and fall months and produce localized cloudburst flooding. Although the total volume of water produced by these storms is comparatively small, the instantaneous and localized runoff rate can be high. Damage from thunderstorms most often takes the form of erosion and sediment transport and deposition. There can also be significant landslides and mud-flows resulting from these storms. Typically, these events occur along the hillsides or at the canyon mouths and adjacent residential developments.

Except for the Promontory Mountains, Blue Creek Valley and Hansel Valley, the West Desert Basin lies almost entirely outside of the Intermountian Seismic Belt. In recent years there has been considerable earthquake activity in and around Hansel Valley and Blue Creek Valley, and even some small earthquakes recorded at Lakeside, west of the Great Salt Lake. The rest of the basin has experienced little earthquake activity and virtually nothing above the 3.0 range on the Richter scale. Still there are faults present throughout the basin and there is potential for a large earthquake to occur. Additionally the soft sediments that make up the valley floors throughout the basin will easily convey and even magnify the ground movement associated with an earthquake over large distances. Consequently a large earthquake could cause structural damage to dams, water pipes, and water storage tanks which in turn could result in flooding problems and/or water shortages. Earthquake activity can also alter the yields from wells and springs.

The only reservoirs in the basin that represent a threat to human life and have therefore been given high hazard ratings are Settlement Canyon, Grantsville and Blue Creek Reservoirs. Of these three, only Blue Creek Reservoir is located in the area that most frequently experiences earthquakes. Settlement Canyon Reservoir, however, is on the west slope of the Oquirrh Mountains which have experienced few earthquakes over the years.

2.14 FISHERIES AND WATER-RELATED WILDLIFE

This is a typical high desert basin, which despite the relatively dry conditions supports a wide and abundant variety of desert wildlife. While the relatively small number of humans living in the basin have limited the impact upon the native environment and the native wildlife, it does not imply that there is not the potential for more significant impacts. The natural environment of the desert basin is a fragile one with the potential for significant impacts from only marginal changes in the environment.

Buffalo once grazed the grassier valleys of the eastern and northern portions of the basin. Today a buffalo herd is managed by the state on Antelope Island but the mule deer is now the principal big game animal in terms of numbers in the basin. Mule deer reside primarily in the foothills and mountains above 5,500 feet in elevation. Several antelope herds range in the valleys and plains of the central and western portions of the basin. Elk are well established in the Deep Creek Range and are in the Stansbury Range as well. A few black bears have survived in the mountain areas, and although cougars and bobcats were on the decrease during the first half of the century, it now appears that they are quite plentiful, along with a significant coyote population. Beavers are rare but marsh areas provide favorable habitat for muskrat. Upland areas support skunks, badgers and fox. Jack rabbits inhabit range lands and cottontails are common on ranges and around farms. Common rodents include porcupines, ground squirrels, prairie dogs, chipmunks, and pack and kangaroo rats.

Thousands of birds are found in the marshes, in fresh water reservoirs and along the shorelines of the Great Salt Lake. Many migrating waterfowl stop here to rest, to feed or to nest and raise their young.

Deep Creek Mountains

Trout can be found in some of the mountain streams in the Stansbury Mountains, Pilot Mountains and Deep Creek Mountains. Trout can also be found in Goose Creek and the Raft River. Bonneville cutthroat trout are found in streams on the Deep Creek Mountains and Lahontan cutthroat trout are found in streams in the Pilot Mountains.

The West Desert provides winter habitat for a variety of raptor species. Bald eagles, rough-legged hawks and peregrine falcons are among the species that migrate into the West Desert valleys during the winter months, and golden eagles and red-tailed hawks are among the year-round residents. The ferruginous hawk, a state threatened species, nests in the West Desert and is particularly sensitive to human disturbance.

At the present time the biggest water-related wildlife problem in the West Desert Basin is the need to establish a comprehensive Great Salt Lake Management Plan that adequately addresses the wildlife issues associated with the Great Salt Lake and the surrounding wetlands. It is estimated that there are approximately 250,000 acres of wetlands surrounding the Great Salt Lake. This is a significant portion of the state's wetlands. At the same time, the Great Salt Lake is the ultimate receiving waters for storm runoff and wastewater treatment plant effluent from the million plus residents of the Wasatch Front and the Bear River Basin. For years storm runoff has carried toxic pollutants into the lake and wastewater treatment plant effluent has conveyed high nutrient loads into the lake. But there has been only limited scientific analysis of the impact these loads have had upon the Great Salt Lake.

2.15 WATER-RELATED RECREATION

Aside from the Great Salt Lake and a few small reservoirs, there are no major lakes or rivers in West Desert Basin. Consequently, except for activities on the Great Salt Lake and occasional water skiing on Rush Lake, there are few opportunities for recreational activities involving direct contact with water. The Fish Springs National Wildlife Refuge is located in the south-central portion of the Great Salt Lake Desert just east of Callao. This facility provides a unique recreational opportunity to visiting wildlife enthusiasts. Ultimately, its isolated setting results in few visitor-days to the refuge. In the northeast portion of the basin, the Great Salt Lake represents the largest recreational water attraction. Ever since the first settlers entered Salt Lake Valley, the Great Salt Lake has been a source of curiosity and a recreational attraction. Presently the recreational development along the shores of the Great Salt Lake have been confined to the east side counties (Salt Lake, Davis, and Morgan).

Other water-related recreational activities include a few city and county parks that offer picnicking and other day-use activities in the immediate proximity to ponds, small lakes and streams.

The Forest Service manages approximately 1,791,140 acres of land in the mountainous regions of the West Desert Basin. There are two state parks in the West Desert Basin: Antelope Island and Great Salt Lake. The

Fish Springs National Wildlife Refuge

federal government manages thousands of acres, including Golden Spike National Historical Site. The largest portion of federal managed lands in the West Desert Basin, however, include the Bureau of Land Management public domain lands and Forest Service lands.

The U.S. Forest Service manages two national forests within the boundaries of the basin. The Sawtooth National Forest is located within the Columbia River Basin in the Northwest corner of the state and sections of the Wasatch-Cache National Forest are located south and west of Tooele Valley in the Stansbury and Sheeprock Mountains. Through the U.S. Fish and Wildlife Service, the federal government manages Fish Springs National Wildlife Refuge just south of the Great Salt Lake Desert.

2.16 FEDERAL PLANNING AND DEVELOPMENT

The role of the federal government is changing from one of construction and development to one of management, preservation, conservation and maintenance. Federal funding programs are decreasing while regulatory programs are on the increase. With the change in federal agency activities, the state is being called upon to take a more active role in the planning and funding of local water projects. Although the federal government has decreased many funding programs, several federal agencies still have management responsibilities and regulatory authorities that are expected to continue indefinitely. Consequently, cooperative participation with federal agencies will continue to be very helpful to the state.

The primary concerns expressed by the various federal agencies in the 1990 Utah State Water Plan are: 1) Reserved water rights; 2) interrelated planning (multiple-use planning); 3) stream and riparian habitat loss; and, 4) water rights filings. An additional concern that has surfaced is coordination between federal, state and local officials. In recent years, progress has been made in each of these areas, particularly in the area of coordination between various federal, state and local agencies.

In the near future, a significant portion of the West Desert basin will be designated as wilderness. The bill currently before congress proposes wilderness designation for 1.1 million acres of BLM and Forest Service land located primarily in the Newfoundland Mountains, the Pilot Range, and the Silver Island Mountains. The bill, however, will face strong opposition from environmental lobbyists who would increase the area to 2.6 million acres primarily in the same areas but also including lands in the Grouse Creek Mountains. Aside from the impending wilderness designations there are no significant federal projects set for the immediate future in the West Desert Basin.

2.17 WATER CONSERVATION

Significant water use reductions can be, and have been, achieved when people understand the reasons to conserve, especially in times of drought. It must be remembered, though, that reducing demand for water is less important if there are no cost savings or if the water cannot be used for other desirable purposes.

Water conservation can be pursued through three strategies: (1) reducing water demand, (2) using the existing water supply more efficiently, and (3) increasing the water supply by operating the storage and delivery facilities more efficiently such as the elimination of conveyance losses, or through other means.

The current water right allotment for irrigation within the basin is four acre-feet per acre. This means ideally up to 295,600 acre-feet of water could be diverted annually for irrigation in the Great Salt Lake Desert and up to 20,800 acre-feet of water can be diverted in the Columbia River Drainage. In contrast to these allocation figures only an estimated 178,300 acre-feet of water is diverted for irrigation in the basin, including 12,200 acre-feet of estimated diversion in the Columbia River Drainage. Irrigators in the Columbia River Drainage divert only 63 percent of their allocated water right, while irrigators in the rest of the West Desert Basin divert only 56 percent of their allocated water right.

Of the four acre-feet allotment, about 2.3 acre-feet per acre is based on crop consumption. The remaining 1.7 acre-feet per acre is based on conveyance and application losses. Even if the conveyance and application losses could be entirely eliminated, the basin's irrigators would still need every bit of water they are currently diverting, and it still would not meet their crop consumption needs. Consequently, there is little opportunity for agricultural water conservation in the West Desert Basin. That is to say, agricultural water conservation would not result in reducing the amount of water diverted or consumed. Improving conveyance and application efficiencies would, however, stretch existing supplies to later in the season where storage is available and could result in higher crop yield.

The culinary water use for 1996 in the West Desert Basin was 260 gallons per capita per day (gpcd). This is well below the statewide average of 320 gpcd. Within the larger communities of Tooele and Grantsville, there are some effective water conservation measures that could be employed to reduce municipal water use. In any system there are unmetered water use and system losses. Although the unmetered uses include fire fighting and park watering, there is still potential for conserving residential water through maintenance and monitoring. Also, programs that improve efficiency of large landscaping systems, such as parks and cemeteries, can realize significant water reductions.

Even for the smaller communities unmetered water use and system losses likely exist. For these communities, as long as the existing supplies are adequate, such losses will probably go unchecked. But when existing supplies are stretched to their limits, it will be wise for such communities to consider conserving their existing supplies through metering and maintenance.

Water conservation measures discussed in this section include: Institutionalizing water conservation, public information and education, water measurement, landscaping and home water savings, pricing, secondary systems, conjunctive use, restricting water use, and wastewater reuse.

2.18 INDUSTRIAL WATER

There is no single agency or entity in Utah that regulates the development or use of industrial water, although its use must conform to existing state laws for water rights, pollution control and other regulations. The single biggest obstacle in identifying the basin's total industrial water use is the proprietary status with which many industries classify their water use statistics.

The primary industrial water use in the basin is for mineral extraction from Great Salt Lake. Six mining companies (AKZO Salt of Utah, Magnesium Corporation of America, Morton Salt, IMC Kalium Ogden Corp., (formerly Great Salt Lake Minerals), North American Salt Company and Mineral Resources International) annually use an estimated 170,961 acre-feet of Great Salt Lake water to extract salt, magnesium, potassium sulfate, magchloride, and other minerals from the lake. This water is diverted to shallow evaporation ponds where over time it is evaporated until the remaining brines have mineral concentrations sufficient to move on to the next step in the mineral extraction process.

It is estimated that approximately 260 acre-feet of culinary water from existing public community water systems is used annually for industrial purposes. This figure represents about 4 percent of the existing culinary water use and is almost entirely in Tooele County primarily in Tooele Valley.

The State Engineer's Office has surveyed and published statewide industrial water-use data for several years. Although the State Engineer's Office maintains confidentiality of the quantity of water used by individual industrial water users, the office has reported the collective 1995 total industrial water use in the West Desert Basin from privately held water rights as 13,760 acre-feet/year. The 1995 data on privately held industrial water rights is shown in Table 18-1. The majority of the privately developed industrial water comes from surface water sources. Kennecott Corporation exports 10,000 acre-feet per year to its Bingham canyon mining operation in the Jordan River Basin.

2.19 GROUNDWATER

Most of the Great Salt Lake Desert area is underlain with groundwater, much of which unfortunately exceeds present drinking water standards for salinity and other parameters. Due to the low precipitation and the very high evaporation rate in the region, only limited amounts of water are available to replenish the groundwater aquifers. Groundwater quality in the basin is best when located along the margins of the mountain ranges where recharge takes place. In general, water quality decreases with distance from these recharge areas.

The largest and most dependable springs of the West Desert Basin are fed by these regional carbonate aquifers. Many carbonate aquifers extend beyond the boundaries of individual valleys. Their flow systems do not always conform to surface water divides.

Groundwater can be found virtually everywhere in Tooele Valley. In some areas it is at a greater depth than others. Some wells produce greater yields than others, but there are few areas in the valley where a well will not yield some water if it is drilled deep enough. Since 1963, the amount of groundwater withdrawal from wells has been as high as 33,000 acre-feet/year in 1974, but averages around 26,000 acre-feet per year.

Well house (Tooele Valley)

The quality of the groundwater throughout the valley varies considerably. Generally, in the eastern portion of the county, groundwater recharge comes from the Oquirrh mountains and water quality ranges from good to excellent. To some extent the same principle holds for the south end of the valley recharged by the South Mountains and the west side of the valley recharged by the Stansbury Mountains. But, recharge in these areas is not as substantial as from the Oquirrhs. Consequently, water quality on the south and west sides of the valley is not as influenced by the recharge as it is on the east side of the valley. As groundwater moves towards the valley center and towards the Great Salt Lake water quality deteriorates and becomes more brackish as total dissolved solids concentrations approach 10,000 mg/l.

Total groundwater recharge for the Tooele Valley is estimated to be 57,000 acre-feet/year. Approximately two-thirds of the recharge (39,200 acre-feet/year) is attributed to the Oquirrh Mountains. Groundwater movement from Rush Valley accounts for 5,000 acre-feet/year, while the South Mountains only contribute 500 acre-feet/year. The Stansbury mountains provide an estimated 12,300 acre-feet of groundwater recharge.

Contents

Section 3

West Desert Basin

Utah State Water Plan

INTRODUCTION

3.1 BACKGROUND

This section includes some general planning guidelines and the organizational arrangements used in preparing the basin plan. It also includes a general physical description of the West Desert Basin, including geography, geology and climate. A brief history of water development in the basin is also presented.

The Board of Water Resources and the Division of Water Resources have a leadership role in water planning and development, and in coordinating water planning activities with other state and federal agencies. The formulation of basin plans fits within the state water policy framework which includes regulation, water rights, conservation, development, protection of water quality and management. Municipal and industrial (M&I), agricultural, fish and wildlife, and recreational uses are all included in the planning process. The interrelationship of water resources demands and activities are recognized and incorporated.

The West Desert Basin Plan is prepared at a reconnaissance level, with a general assessment of problems and needs. Water management issues, water quality protection activities, and conservation needs are delineated, and all potential uses are considered. The formation of the basin plan is intended to provide a balance of environmental, economic, social and political factors.

Previous water-related studies conducted by state and federal agencies in the West Desert Basin have provided important information on the resources and, in some cases, alternative water development plans. The studies used in preparing this report are listed by number in Section B, and are occasionally referenced in the narrative by the same number.

It is impossible to look into a crystal ball and see with certainty all the future water needs of the West Desert Basin. Use of an orderly process of planning, conservation and development of water resources will provide the flexibility needed to adjust to future conditions.

Over the years, many water supply projects have been built by private individuals, nonprofit irrigation companies, incorporated municipalities and other water users. The state and federal government have participated with technical and financial assistance in many of these projects. Future water projects will be required to meet the increasing demand for water within the basin.

3.2 PLANNING GUIDELINES

The State Water Plan describes the basic premises and lays the foundation for state water planning. This ensures continuity so individual basin plans will be consistent with the statewide plan and with each other. To be flexible and accommodate changes in needs and circumstances, the plan is intended to be revised as needed. This will provide opportunities for all state and federal agencies, as well as local government entities, organizations and individuals to present their concerns.

3.2.1 Guiding Principles

There are a number of guiding principles used in the development of the State Water Plan. These principles were developed by the State Water Plan Coordinating Committee and are listed below:

- All waters, whether surface or subsurface, are held in trust by the state as public property and their use is subject to rights administered by the State Engineer.
- Water is essential to life. It is our responsibility to maintain or improve water quality to meet the needs of the generations that will follow.
- The diverse present and future interests of Utah's residents should be protected through a balance of economic, social, aesthetic and ecological values.
- Public water uses for which it is difficult to identify specific beneficiaries, such as recreation, aesthetics, fish and wildlife, should be included in the water planning and development process.
- Public input is vital to water resources planning.
- All residents of the state are encouraged to exercise water conservation.
- Water rights owners are entitled to transfer their rights under free market conditions.
- Water resources projects should be technically, economically, and environmentally sound.
- Water planning and management activities of local, state and federal agencies should be coordinated.
- Local governments, with state assistance as appropriate, are responsible for protecting against emergency events such as floods and droughts.
- Designated water uses and quality should be improved or maintained unless there is evidence the loss is outweighed by other benefits.
- Educating Utahns about water is essential. Effective planning and management requires a broad-based citizen understanding of water's physical characteristics, potential uses and scarcity.

3.2.2 Purpose

The main purpose of this basin plan is to inventory existing resources, assess existing conditions, identify problems and issues, and describe potential development alternatives for meeting the water needs of future generations. The State Water Plan and individual river basin plans can provide guidance and help coordinate the planning efforts among all state, federal and local entities and can be the vehicle to involve concerned parties.

The West Desert Basin Plan is intended to be a resource to local water planners. It includes an inventory of water supplies and projections of future population and water demands. It also includes a description of water problems, options available to resolve them and recommendations for future action. One main purpose is to identify problems which need early attention. Each recommendation addresses an identified need and is consistent with the state water policies identified in the 1990 State Water Plan.

3.2.3 Organization

State water planning is the responsibility of the Division of Water Resources under the policy guidelines of the Board of Water Resources. With this in mind, a State Water Plan Coordinating Committee, representing 12 state agencies, facilitates preparation of each basin plan. There is also a steering committee consisting of the chair and vice chair of the

Board of Water Resources, the executive director of the Department of Natural Resources, and the director and assistant director of the Division of Water Resources. Four Board of Water Resources members representing different areas of the West Desert Basin participated in the basin's steering committee. This committee provides policy guidance, resolves issues and approves the plan prior to acceptance by the Board of Water Resources.

In addition, federal and other state agencies participate as cooperating entities. These agencies have particular expertise in various fields to assist with plan development. A statewide local advisory group, representing various organizations and special interest groups is invited to provide input and plan review. This group represents a spectrum of various interests and geographical locations.

A local basin planning advisory group for the West Desert Basin provided input by way of advice, review and decision-making. Most of the members of this group reside within the basin, or are directly involved in basin affairs. They represent various local water interests and provide geographical representation within the basin.

3.2.4 Process

By the conclusion of the review and approval process, four drafts of the West Desert Basin Plan will have been prepared. These are: (1) In-House, (2) Committee, (3) Advisory, and (4) Public review drafts. After this process, the final report was distributed to the public for its information and use. Public involvement is an important part of the planning process, and is necessary in assessing actual viewpoints and conditions in the basin. The opportunity for public discussion and input has been provided at the local, state and federal levels as plan formulation moved through various phases.

3.3 BASIN DESCRIPTION

The West Desert Basin is located in the northwest corner of the state and extends along the Nevada state line, into the southern portion of the state (Figure 3-1). It is bounded to the east by the Bear River Basin, the Weber River Basin, the Jordan River Basin, the Utah Lake Basin, the Sevier River Basin and to the south by the Cedar/Beaver Basin.

The West Desert Basin, including the Great Salt Lake, comprises roughly 11.7 million acres, or approximately 22 percent of the state's total area. By contrast, it is home to just over 38,500 residents or about 1.8 percent of the state's total population. Approximately 88 percent of the basin's population, or roughly 33,860 people, reside on 7 percent of the basin's land, in Tooele and Rush valleys. The remaining nearly 4,660 residents of the basin reside on the remaining 93 percent of the basin's land at a population density of approximately one resident per 4 square miles.

The West Desert Basin consists primarily of broad arid valleys separated and bounded by a series of mountainous regions. These mountains serve as catchment areas for precipitation in the form of snow in the winter and rain at other times of the year, providing the desert valleys with intermittent and ephemeral streams. Although many streams flow perennially in the mountain canyons, only a few, such as Blue Creek in Box Elder County, flow year round once they reach the desert valleys. Several agricultural communities have developed and even flourished in the desert valley environments through prudent use of the limited groundwater and surface water supplies.

To facilitate the discussion of issues and concerns, the basin has been divided into four sub-basins as shown in Figure 3-2: Box Elder County, Great Salt Lake Desert, Tooele/Rush Valley and the Great Salt Lake. A description of each of the sub-basins follows:

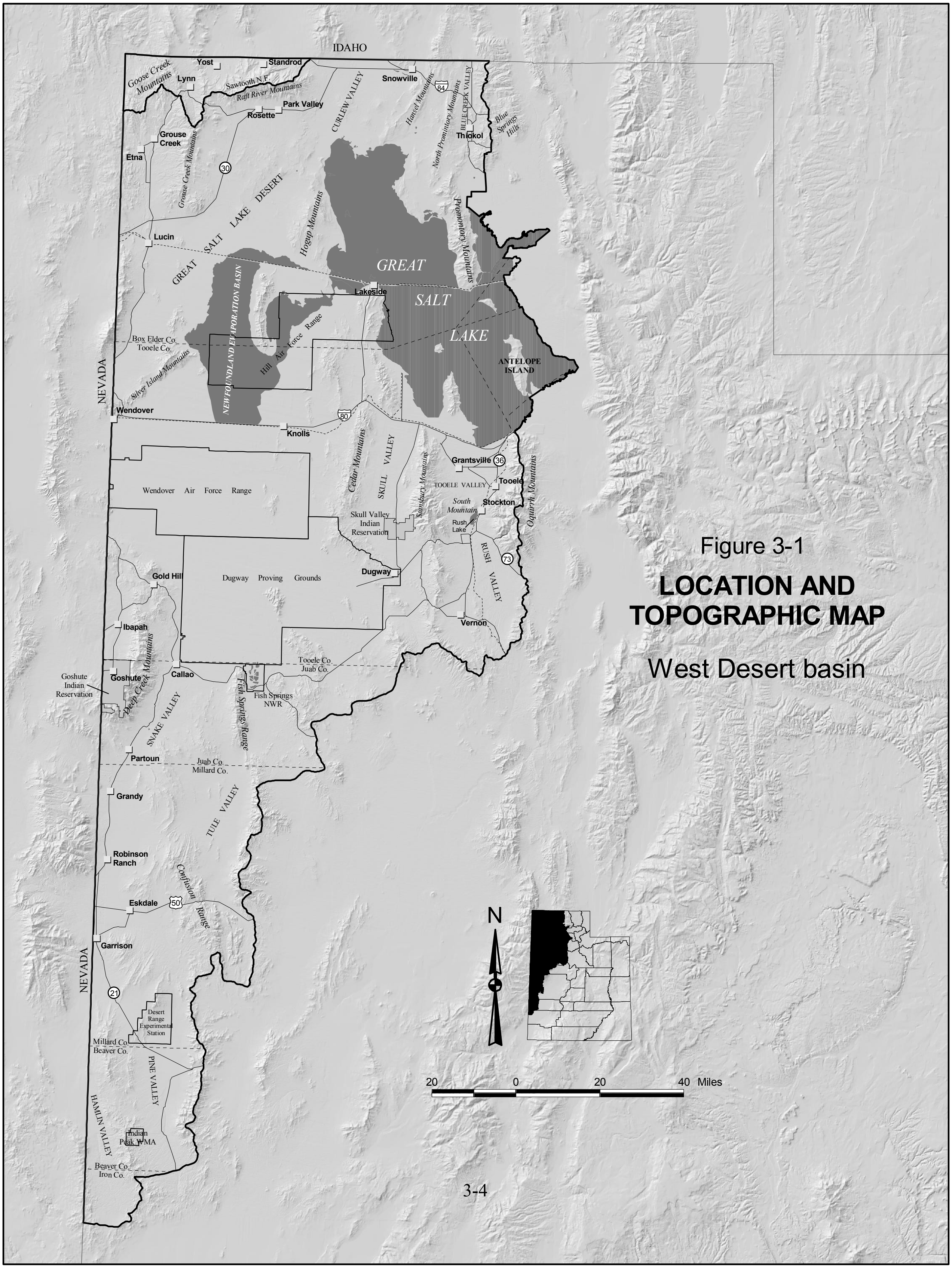


Figure 3-1

LOCATION AND TOPOGRAPHIC MAP

West Desert basin

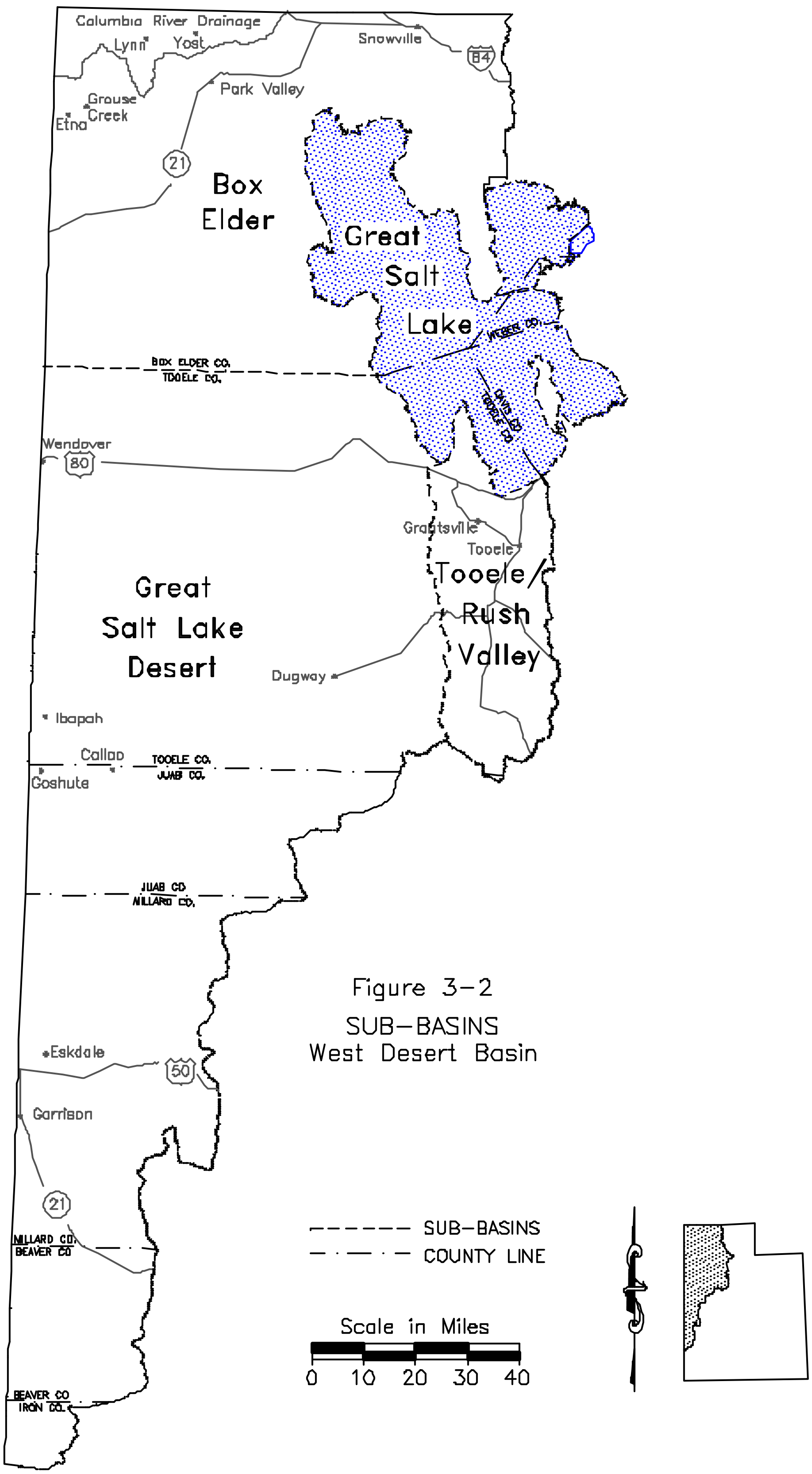


Figure 3-2
SUB-BASINS
West Desert Basin

Box Elder County Sub-basin

The Box Elder County sub-basin includes communities in the area of the Promontory Mountains (Blue Creek, Howell, Hansel Valley and East Promontory), the town of Snowville in Curlew Valley, the Park Valley/Rosette area, the Grouse Creek/Etna area, and the Columbia River drainage (Lynn Yost, and Standrod). The total population of the Box Elder County sub-basin is 1,180 people.

The Promontory area is bounded on the north by Idaho, on the south by the Great Salt Lake, on the west by the Hansel Mountains and on the east by Blue Spring Hills. The Golden Spike National Historic Site is located near the center of the area. From this point, the Promontory Mountains extend south and form a peninsula which extends into the Great Salt Lake. The North Promontory Mountains run to the north from the Golden Spike National Historic Site. West of the North Promontory Mountains is Hansel Valley, primarily an agricultural community. East of the North Promontory Mountains is Blue Creek Valley, which features the agricultural communities of Blue Creek and Howell, and a major industry, Thiokol, Inc.

Curlew Valley is immediately north of the Great Salt Lake and is couched between the Raft River Range to the west and the Hansel Mountains to the east. The valley's only community, Snowville (pop. 280), is the basin's largest community outside of Tooele County. Curlew Valley extends northward into Idaho and consequently Snowville residents compete with two Idaho towns, Stone and Holbrook for surface water and groundwater supplies.

The Park Valley area is located north and northwest of the Great Salt Lake. It is bounded on the north by the Columbia River Basin and the state of Idaho, on the east by Curlew Valley and the Great Salt Lake, on the south by the Great Salt Lake Desert and on the west by the state of Nevada. The largest communities in the Park Valley area are: Park Valley, Rosette, Grouse Creek and Etna.

The Grouse Creek/Etna area has 4,110 acres of irrigated cropland, and 1,290 acres of dry crop land. To the east, the Park Valley area has 7,390 acres of irrigated cropland and 2,380 acres of dry cropland. In Curlew Valley there are 16,240 acres of irrigated crop land and 25,050 acres of dry cropland. Blue Creek Valley, Promontory Mountain and Hansel Valley have 8,400 acres of irrigated lands and 84,100 acres of dry cropland. See Table 3-3 (page 3-16) for complete breakdown of cultivated lands within the basin.

The Columbia River drainage includes 393 square miles or 250,000 acres in the extreme northwest corner of the state. This area is a mountainous region featuring the Goose Creek Mountains, Grouse Creek Mountains and the Raft River Mountains. Creeks flowing from the north facing slopes of these mountains are tributary to either Goose Creek or Raft River, which in turn flow into the Snake River and ultimately the Columbia River. A primary feature of the area is the Sawtooth National Forest located on the north face of the Raft River Mountains. There are four very small Utah communities in the area: Clear Creek, Lynn, Standrod and Yost. Each of these communities is comprised of a few homes and adjacent farm lands. The total population of all four communities is estimated to be about 50 people.

Gold Hill

Of that total 250,000 acres in this area, about 4,870 acres are irrigated and there are about 1,850 acres of dry-crop land or dry pasture. The vast majority of the Columbia River basin's land is native sagebrush, perennial grasses, and forest.

The Great Salt Lake Desert Sub-basin

The Great Salt Lake Desert sub-basin includes a vast region of sparsely populated desert terrain and salt flats directly west of the Great Salt Lake. It includes Skull Valley southwest of the Great Salt Lake as well as several desert valleys to the south: Snake Valley, Tule Valley, Pine Valley, and Hamlin Valley. The largest community located in the Great Salt Lake Desert is Wendover, at the Utah/Nevada state line. There are several small communities located in the valleys to the south. Ibapah and Goshute are located west of the Deep Creek Mountain Range near the Utah/Nevada state line. Gold Hill is the remnant of a small mining community in the foothills north of the Deep Creek Mountains. Callao is directly east of the Deep Creek Mountains at the north end of the Snake Valley. Trout Creek, Partoun and Gandy are located in Snake Valley south of the Deep Creek Mountains. At the south end of the Snake Valley are Robinson Ranch, Eskdale and Garrison. Also included in the sub-basin are the Dugway Proving Grounds, a military weapons testing facility located south of Skull Valley, and the Fish Springs National Wildlife Refuge located at the south end of the Great Salt Lake Desert.

At the eastern edge of the sub-basin is Skull Valley, approximately 36 miles long and 12 miles wide. Skull Valley is situated between the Cedar Mountains to the west and the Stansbury Mountains to the east. There are a few scattered ranches and the Skull Valley Indian Reservation at the south end of the valley. Skull Valley's population is estimated to be 60 persons.

The vast majority of the Great Salt Lake Desert sub-basin's four million acres is classified as salt desert shrub and desert grassland, or greasewood, sagebrush and perennial grassland. (See Table 3-4). Only about 20,580 acres of land in this sub-basin has been cultivated. This includes 15,930 acres of irrigated land, 2,060 acres of dry cropland, and 2,590 acres idle and fallow land. See Table 10-1 for a detailed breakdown of cultivated lands.

Tooele-Rush Valley Sub-basin

The Tooele-Rush Valley sub-basin, also known as the Shambip River Basin, includes Tooele Valley which drains into the Great Salt Lake, and Rush Valley which drains to Rush Lake. Like the Great Salt Lake, Rush Lake is a terminal lake with no surface outflow.

Tooele Valley is the most heavily populated region in the West Desert Basin. Tooele Valley is bounded on the north by the Great Salt Lake, the west by the Stansbury Mountains, and the east by the Oquirrh Mountains. At the south end of the valley, South Mountain forms a natural boundary between Tooele and Rush Valley. Rush Valley is bounded on the north by South Mountain, on the west by Onaqui Mountains, on the east by the Oquirrh Mountains and the East Tintic Mountains, and on the south by the Sheeprock and West Tintic Mountains. The fertile Tooele Valley is home to almost 27,000 people most of whom, until recently, resided primarily in two large communities: Tooele and Grantsville. In recent years though, large tracts of agricultural lands in the unincorporated portions of the valley have been converted to residential developments as more and more Salt Lake commuters have chosen to reside in the rural setting provided by Tooele Valley. Consequently, in recent years Tooele Valley has experienced considerable growth, particularly in the communities of Lincoln, Erda, Lake Point and Stansbury Park.

Water quality at the headwaters of each of the sub-basin's 12 major streams is excellent. As the streams flow towards the valley floor, and eventually to the Great Salt Lake or Rush Lake, water quality becomes poorer as a result of silt and salt loading.

In Rush Valley there are approximately 7,570 acres of irrigated cropland, and about 1,150 acres of non-irrigated cropland and dry pasture. Tooele Valley has nearly 13,790 acres of irrigated cropland and about 5,840 acres of dry crop land and dry pasture. An estimated 1,050 people live in Rush Valley. Most of the remaining 736,000 acres in Rush and Tooele valleys are wildlife land, forest land, rangeland and water areas.

Also located in Rush Valley is the U.S. Army's Tooele Chemical Agent Disposal Facility. This facility, located about 12 miles south of Tooele, was built to destroy the forty-two percent of the nation's chemical weapons and agent that is stockpiled at the Tooele Army Depot. The Tooele Chemical Agent Disposal Facility is a state-of-the-art engineered facility with specially designed weapons handling processes and, remote-controlled disposal equipment. The plant systems protect the environment by cleaning the air and decontaminating the solid wastes produced. The plant's pollution abatement systems insure that the facility emissions meet or exceed all federal, state and local standards. Air is constantly tested inside the plant and inside the stack to verify that there is no detectable agent. No process liquid wastes are discharged from the facility and all surface runoff from the plant is contained and evaporated on site.

The Great Salt Lake Sub-basin

The Great Salt Lake is included here as a sub-basin of the West Desert Basin. The Great Salt Lake does have its own set of unique water-related issues and problems. Land-use data in the Bear River, Weber River and Jordan River basin plans identified lands down to elevation 4208. Consequently the Great Salt Lake sub-basin, as defined here, includes the lake and shoreline up to elevation 4208.

The Great Salt Lake is the low point of a 22,000 square mile drainage basin that includes parts of Idaho, Nevada, Wyoming and Utah. It receives some inflow from the Great Salt Lake Desert, but its major sources are the surface water flows from the Bear River, Weber River, and Jordan River. Consequently, the Great Salt Lake is affected by water use not only in the Great Salt Lake Desert, but throughout the Bear, Weber, and Jordan river basins. For many decades, the Great Salt Lake was not managed as a natural resource and little thought was given to the impacts upon it. Because it has no outlet, any material (nutrient or pollutant) conveyed to the Great Salt Lake remains there until it can be broken down by natural processes. Consequently the lake, despite its size, is sensitive to pollution. The primary issues currently affecting the Great Salt Lake are:

- the impact upon wetlands and bird habitat by encroaching development;
- unbalanced salinity levels between the north and south arms of the lake;
- reduced brine shrimp populations due to the salinity imbalance, and;
- uncontrolled flow of nutrients and toxic pollutants into a lake that essentially has no water quality standards established to safeguard its water quality.

For years these issues have attracted little attention. The salinity of the lake has rendered it of little value for municipal, agricultural, or most other uses. Mineral extraction industries around the Great Salt Lake, however, provide hundreds of jobs and represent millions of dollars to the Utah economy. The brine shrimp industry also provides significant jobs and considerable economic benefits to the state. In addition to these economic values, the Great Salt Lake is a unique environmental habitat, visited by millions of migratory birds annually, and home to many thousands of birds and other wildlife living in the approximately 250,000 acres (including wetlands in the Jordan and Weber river basins) of wetlands presently existing around the lake.

The Utah Department of Natural Resources recognizes the need to provide better management of the Great Salt Lake. In an effort to develop guidelines that will balance the diverse interests of industry and wildlife, the department published the Great Salt Lake Comprehensive Management Plan and Decision Document on March 1, 2000

3.3.1 Topography and Geology

The West Desert Basin lies within the Great Basin physiographic province, and has no external drainage. It is characterized by small fault-block mountains and intervening alluviated valleys. Some valleys are topographically closed, while others drain to larger valleys or to the Great Salt Lake Desert. During the last ice age, most of the area contributed to ancient Lake Bonneville, which drained northward to the Snake and Columbia rivers.

Basin elevations range from about 4,200 feet above sea level at the Great Salt Lake to over 12,000 feet in the Deep Creek Range. Desert valleys lie between 4,200 and 7,000 feet with the higher valleys occurring in the southern end of the basin. Most of the mountain peaks in the basin are between 8,000 and 10,000 feet above sea level. There are, however, peaks in the Stansbury Mountains, Oquirrh Mountains, and Deep Creek Mountains that rise into the 10,000 to 12,000 foot range. Almost all of the West Desert Basin's mountain ranges run north and south. The lone exception is the Raft River Range in the extreme northwest corner of the state which runs east and west. Except for Pine Valley and Tule Valley, which are closed basins with no surface water outlets, the West Desert Basin's surface flows, when they exist, flow toward the Great Salt Lake.

The mountain blocks are composed mostly of rocks of Paleozoic and Precambrian age (Figure 3-3). These hard, brittle rocks are permeable when fractured, and can provide groundwater aquifers. The Paleozoic formations include several limestone and dolomite units, which constitute an important regional aquifer system (see chapter 19). The centers of the valleys and basins are typically underlain with lacustrine silt and clay (Ql in Figure 3-3), which have low permeability, and contain water with high dissolved solids. The alluvial slopes fringing the mountain blocks (Qa in Figure 3-3) are composed of more permeable sand and gravel, and form important local aquifers.

Evaporation of water from local closed basins concentrates dissolved solids, which may appear as saline or brackish groundwater at depth, or in the larger basins may appear as deposits of salt at the surface. Minerals become arranged in zones by elevation around a closed basin according to their solubility. Such mineral zonation has created economic deposits of potassium and magnesium minerals in parts of the Great Salt Lake Desert. Groundwater quality generally follows the same pattern of distinct zones.

3.3.2 Climate

The climate of the West Desert Basin is typical of mountain-desert areas in the West with wide ranges in temperature between summer and winter, and between day and night. The high mountain regions experience long, cold winters, and short, cool summers. The lower valleys experience greater seasonal fluctuations with temperatures ranging from recorded extremes of -40^0 F at Ibapah in the winter to over 110^0 F in arid valleys during the summer (See Figure3-4). Daily fluctuations in temperature can be dramatic in the desert valleys as well as the mountains. Daily temperature swings of more than 40 degrees would not be uncommon in any season. Each year there are typically 189 frost free days in Wendover, 164 frost free days in Tooele, 85 frost free days in Grouse Creek and only 67 frost free days in Ibapah (See Table 3-1).

The West Desert Basin lies within the rain shadow of the Sierra Nevada mountains and, except for the high mountain tops, the lands within the basin are classified as arid or semi-arid. Wendover and Callao receive as little as 5 inches of precipitation per year while Tooele, benefitting from its close proximity to the Oquirrh Mountains, receives 18.5 inches of precipitation per year (See Figure 3-5).

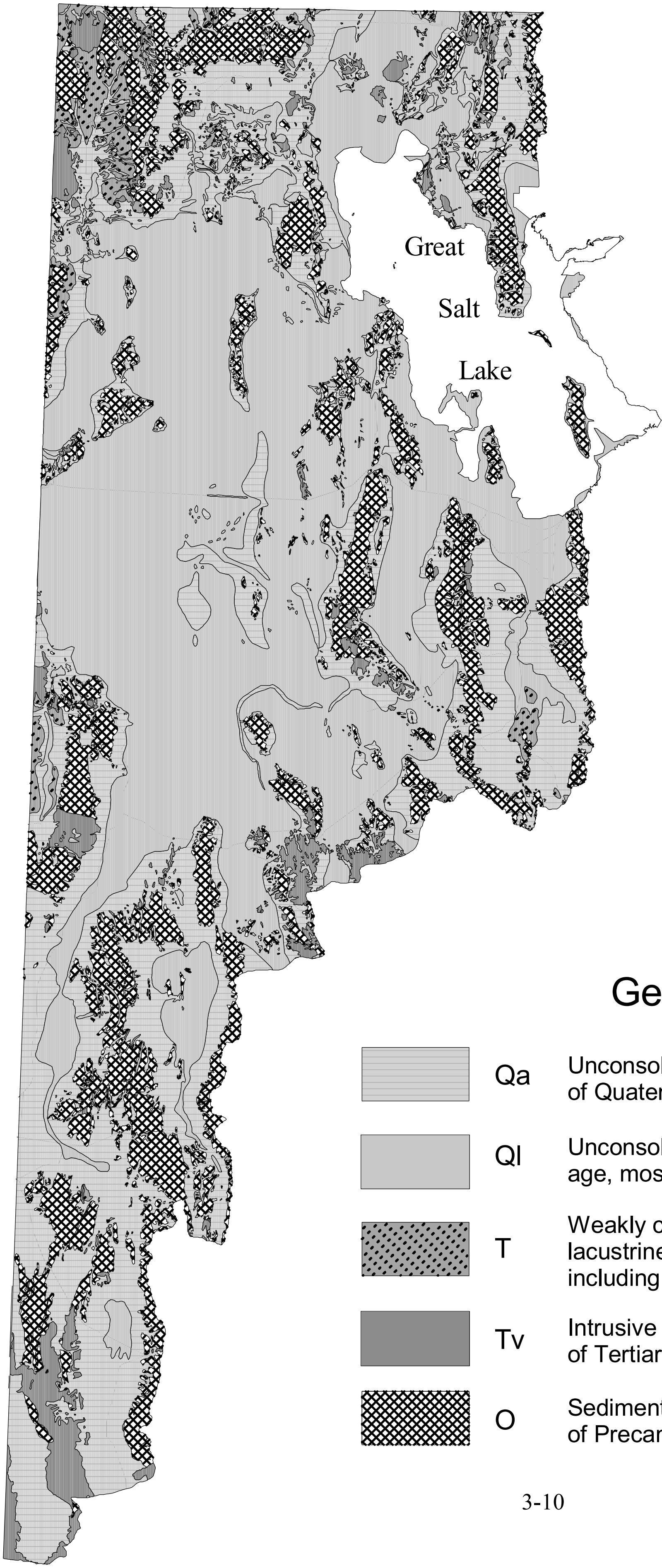
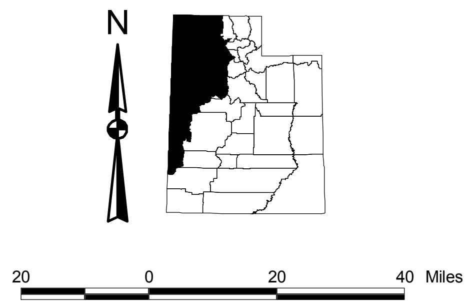


Figure 3-3

GENERALIZED GEOLOGY

West Desert Basin



Geologic Units

Qa	Unconsolidated alluvial and aeolian deposits of Quaternary age, mostly sand and gravel.
Ql	Unconsolidated lake deposits of Quaternary age, mostly sand, silt, and clay.
T	Weakly consolidated basin filling alluvial, lacustrine, and volcanic deposits of Tertiary age, including the Salt Lake Formation.
Tv	Intrusive and extrusive volcanic rocks of Tertiary age.
O	Sedimentary, metamorphic, and volcanic rocks of Precambrian, Paleozoic, and Mesozoic age.

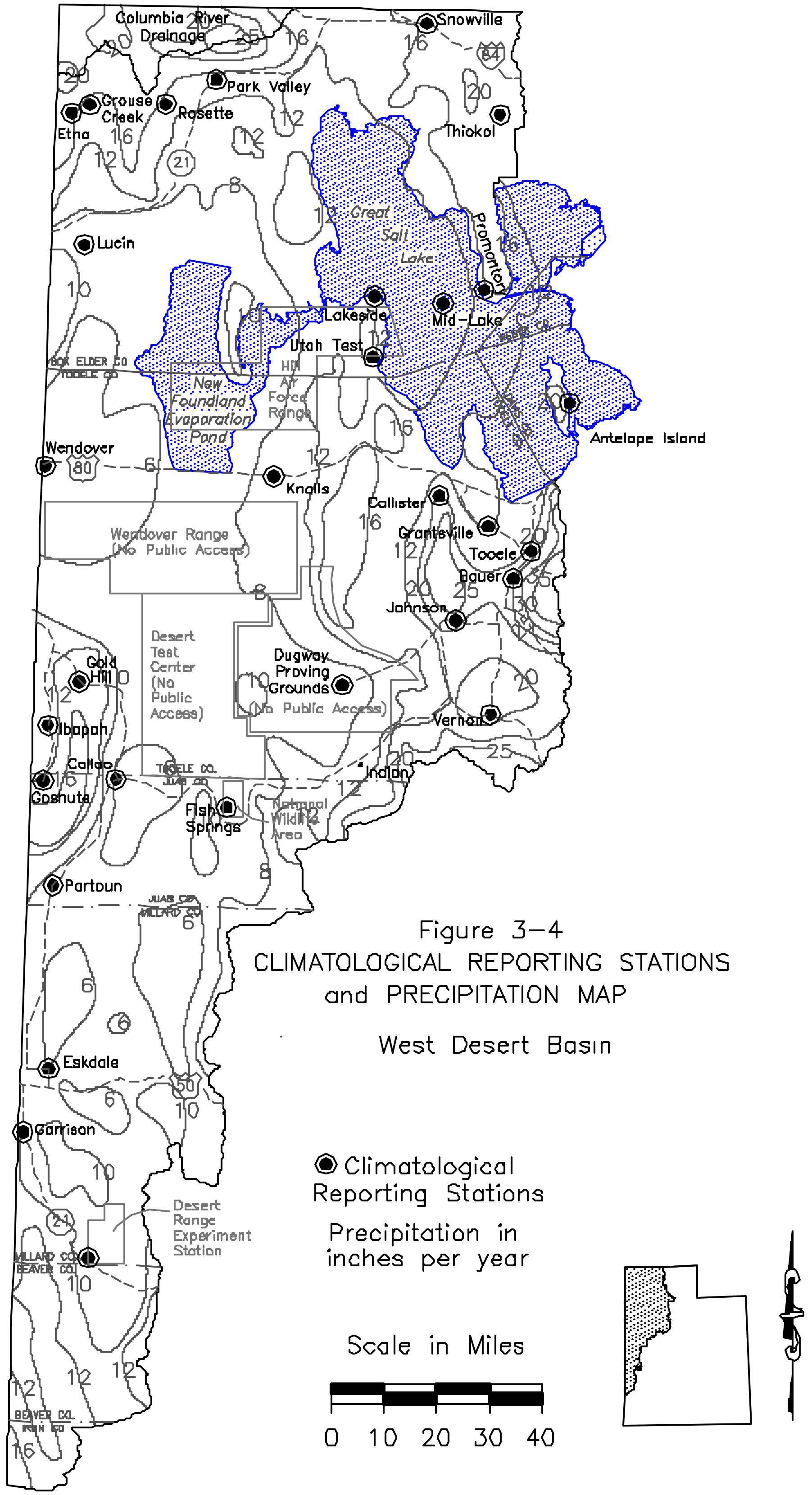


Figure 3-4
CLIMATOLOGICAL REPORTING STATIONS
and PRECIPITATION MAP

West Desert Basin

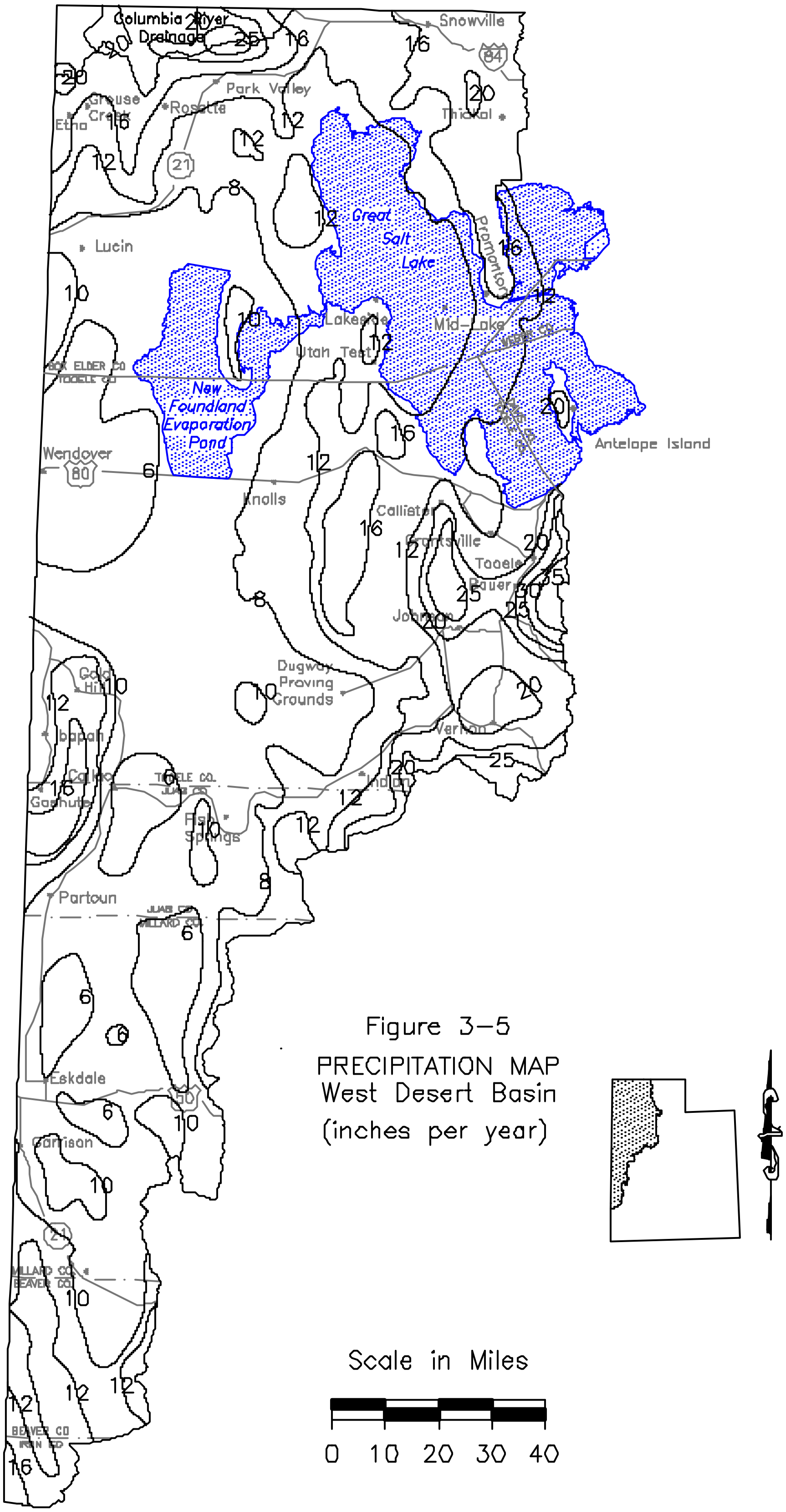


Figure 3–5
PRECIPITATION MAP
West Desert Basin
(inches per year)

Scale in Miles

0 10 20 30 40

Table 3-1
Mean Temperature
West Desert Basin

Station	Elevation	Monthly				Mean Annual (F°)	Frost free Days
		January		July			
		Max (F°)	Min (F°)	Max (F°)	Min (F°)		
Bauer	4950	38	15	92	58	49	136
Callao	4330	46	19	90	57	49	131
Callister Ranch	4600	38	18	92	58	50	130
Desert Experiment Range	4590	41	12	92	55	49	121
Dugway	4340	37	15	94	62	51	144
Eskdale	4980	41	13	93	57	50	118
Fish Springs Refuge	4225	39	17	95	64	53	157
Garrison	5277	42	15	93	57	51	121
Gold Hill	5315	39	20	92	63	52	151
Grouse Creek	5320	35	9	88	50	44	85
Ibapah	5280	42	10	92	46	46	67
Johnson	5630	38	16	89	59	49	131
Knolls	4240	34	11	94	62	50	142
Lakeside	4217	36	21	92	69	52	192
Lucin	4360	33	10	92	56	48	131
Midlake	4214	34	25	86	71	53	196
Park Valley Muddy Ranch	5543	35	15	88	56	47	120
Partoun	4780	40	13	95	56	50	117
Rosette	5685	34	14	86	55	46	117
Snowville	4540	33	10	91	51	45	99
Thiokol	4600	33	11	91	54	47	119
Tooele	5070	38	20	89	63	51	164
Vernon	5485	38	12	89	54	47	109
Wendover	4237	35	19	92	68	52	189

Note: All temperatures are 1961-90 normal values.
Frost-free days are the average number of days between the final spring freeze and initial fall freeze. (32°F)
Source: Utah Climate

Table 3-2 summarizes annual precipitation and evapotranspiration data. The highest mountain peaks receive 25 to 35 inches per year, primarily in the form of snow during the winter months. Summers are hot, dry, and windy. June to September is the driest part of the year with precipitation at its lowest, while evaporation and transpiration rates are at their highest. During this period, natural moisture resources are inadequate to meet agricultural needs and irrigation is needed. Little net benefit is obtained from summer rains which are either too light to soak the soil, or come as cloudbursts, resulting in rapid run-off and consequently providing little soil moisture.

3.3.3 Soils and Vegetation

Soil surveys are made to describe the soil profile and the related vegetation. Land use is generally dictated by the soil types and the vegetation produced. The Natural Resources Conservation Service has responsibility for all soil surveys regardless of land ownership or administration, although the Forest Service

Table 3-2
Precipitation and Evapotranspiration
West Desert Basin

Station	Elevation	Annual Precipitation (inches)	Annual Evapo-transpiration (inches)
Bauer	4950	12.4	46.9
Callao	4330	6.1	48.7
Callister Ranch	4600	12.8	48.8
Desert Experiment Range	4590	6.2	50.9
Dugway	4340	8.2	48.6
Eskdale	4980	6.3	51.7
Fish Springs Refuge	4225	8.1	49.2
Garrison	5277	8.0	51.2
Gold Hill	5315	11.1	49.4
Grouse Creek	5320	11.4	44.6
Ibapah	5280	10.0	51.0
Johnson Pass	5630	16.8	44.9
Knolls	4240	5.8	49.3
Lakeside	4217	6.2	42.2
Lucin	4360	8.7	47.3
Midlake	4214	8.7	33.3
Park Valley Muddy Ranch	5543	9.9	42.8
Partoun	4780	7.1	52.0
Rosette	5685	11.6	41.4
Snowville	4540	12.8	46.2
Thiokol	4600	14.1	46.6
Tooele	5070	18.5	42.5
Vernon	5485	10.1	46.5
Wendover	4237	5.5	43.4

Note: All precipitation values are 1961-90 normals
source: Utah Climate

carries out surveys on national forests. For most of the basin, soil survey mapping has been completed but has yet to be published. The only area that has been published is eastern Box Elder County. The Beaver County portion of the basin has not yet been surveyed.

Some soils in the valley floors are affected by salt and alkali and are generally not suited to agriculture. The soils that are best suited for irrigation are typically deep and range in texture from moderately coarse to moderately fine and are located on the fans and terraces adjacent to the mountains. These areas comprise the largest portion of the arable lands and range in elevation from 4,400 to 5,600 feet. The soils of the upper valleys, above the 5,200 feet elevation (just above the highest level of ancient Lake Bonneville), have developed from alluvial sediments on flood plains, alluvial fans, and foot slope areas at the base of the mountains. Quartzite and sandstones are the predominant parent material for the alluvium found in the upper valleys. Being so near the source of parent materials, the valley fill in the upper valleys consists mainly of coarse sands and gravels, although there are areas of medium- to fine-textured topsoils.

The vegetation on the lower elevations of the desert mountains consists of grasses and shrubs with pinyon pine and Utah juniper trees predominantly on the east-facing slopes. At higher elevations, Douglas fir and ponderosa pine occur on the northern slopes also. In general, arable soils of the basin have good water transmission properties and adequate moisture-holding capacity which, with other favorable physical and chemical properties, make them well-suited for irrigated agriculture. Only a small portion of the 1,037,200 acres of arable land, shown in Table 3-3, have been cultivated either for dry-farming tracts or irrigation.

In Tooele-Rush Valleys, high elevation lands are composed of quartzite, limestone, and dolomite. Granite, limestone, and dolomite predominate the foothills. The valley floors are colluvium, alluvium and lake bed sediments with mostly flat to gently sloping surfaces. The lake bed sediments near the Great Salt Lake are permanently moist and have a high salt content. In Tooele-Rush Valleys, the dominant native vegetative cover types in the high mountains are conifer and aspen forests. In the lower mountain and foothill areas, Gamble oakbrush, juniper-pinyon and sagebrush-grass vegetative types are common. In the upper valley floor areas, near the Great Salt Lake, salt desert shrub vegetative types predominate. The general distribution of land cover types is given in Table 3-4. As elevation varies from 4,200 to 12,000 feet, and precipitation varies from 5 inches to 35 inches, so also does vegetation vary. Bristlecone pine dominates on many mountain ranges at the timber line. Above approximately 8,000 feet, alpine forests of Douglas fir, limber pine, or sub-alpine fir generally dominate on the better sites. Below 8,000 feet, the alpine forests give way to the mountain-brush type vegetation consisting of mountain mahogany, cliffrose and other shrub species, with Gamble oak on some sites, then to pinyon-juniper woodlands intermingled with sagebrush and grasses. Below these woodlands and sagebrush, grasses with some shadscale

Table 3-3
Arable Acreage vs Cultivated Acreage
West Desert Basin

Sub-Basin	Unit Name	Arable acreage	Cultivated Acreage			
			Irrigated	Idle/Fallow	Dry-Crop	Total
Box Elder	Columbia River Basin	40,800	4,870	340	1,850	7,060
	Grouse Creek	30,600	4,110	670	1,290	6,070
	Park Valley	156,600	7,390	1,300	2,380	11,070
	Curlew Valley	109,000	16,240	4,840	25,050	46,130
	Blue Creek Valley*	138,300	8,400	280	84,100	92,780
	Lucin	20,000	470	80	0	550
	Subtotal	495,300	41,480	7,510	114,670	163,660
Great Salt Lake Desert	Snake Valley	69,900	6,730	1,010	0	7,740
	Callao/Trout Creek	11,800	2,800	900	1,410	5,110
	Goshute Valley	18,100	4,240	540	70	4,850
	Dugway Valley	61,100	0	0	0	0
	Skull Valley	134,200	2,160	140	580	2,880
	Subtotal	295,100	15,930	2,590	2,060	20,580
Tooele-Rush Valley	Tooele Valley	71,000	13,790	2,130	5,840	21,760
	Rush Valley	175,800	7,570	2,730	1,150	11,450
	Subtotal	246,800	21,360	4,860	6,990	33,210
Basin Total		1,037,200	78,770	14,960	123,720	217,450

* Includes Hansel Valley and Promontory Mountains

Table 3-4
VEGETATIVE COVER AND LAND USE (1988)
West Desert Basin
(acres)

Cover/Use	Columbia River Basin	West Desert Basin (excluding Columbia River drainage)	Total
Wet and open water areas			
Open water	30	1,112,700	1,112,730
Pickleweed barrens	0	685,940	685,940
Wetlands / wet meadow*	60	39,660	39,720
Lowland riparian	310	13,940	14,250
Mountain riparian	2,400	7,960	10,360
Uplands			
Barren rock	0	1,036,500	1,036,500
Alpine: conifer and aspen	11,760	216,010	227,770
Deciduous: oak, maple & mahogany	1,460	36,020	37,480
Juniper -pinyon and mountain shrub	57,710	1,658,600	1,716,310
Greasewood, sagebrush & perennial grass	138,940	2,073,400	2,212,340
Grassland / dry meadow	30,090	1,156,600	1,186,690
Salt desert shrub and desert grassland	1,480	3,204,500	3,205,980
Urban:			
Residential	20	7,750	7,770
Open space	70	330	400
Commercial & industrial	10	5,000	5,010
Agricultural:			
Irrigated	4,870	73,900	78,770
Idle/fallow	340	14,620	14,960
Dry-farm	1,850	121,870	123,720
Total	251,400	11,465,300	11,716,700

* This figure represents only the wetlands/wet meadow areas that have thus far been mapped. The figure could be low.
Source: Water-Related Land Use Inventories, Division of Water Resources, 1994; and Division of Wildlife Resources data.

dominate. At the valley floor, the vegetation becomes sparse because of lower precipitation, and in some areas, an increase in soil salinity.

Urban and agricultural land use currently accounts for less than 1 percent of the basin's total lands. Only about 2 percent of the basin is forested with either conifers or aspen and 34 percent fall into mountain-brush, juniper, sagebrush, greasewood vegetative types. Sixteen percent of the basin is classified as open water, riparian, marshland or wetlands. This, however, includes over a million acres of the Great Salt Lake and more than a half a million acres of pickleweed barrens. See Table 3-4 for a detailed breakdown of the various vegetative cover types and land use.

3.3.4 Land Ownership and Use

The federal government manages more than 7.5 million acres of the basin's total 11.7 million acres. The biggest portion of that (5.4 million acres) is managed by the Bureau of Land Management. The U.S. military has 1.8 million acres, and the Forest Service manages 245 thousand acres. Including the Great Salt Lake, the state manages just over 1.9 million acres. Just over 2.2 million acres of the basin is privately owned. See Table 3-5, Figure 3-6 and Figure 3-7 for details.

In the Tooele-Rush Valley sub-basin, there is approximately 278,000 acres of privately owned land, 52,600 acres of state administered land; 43,100 acres administered by the Department of Defense (Tooele Army Depot); 248,600 acres administered by the Bureau of Land Management; 92,900 acres administered by the Forest Service; and 53,500 acres of water surface.

3.4 WATER RELATED HISTORY

The Great Salt Lake is the remnant of ancient Lake Bonneville. In the past 100,000 years, the lake has fluctuated dramatically establishing numerous shorelines throughout the basin. These shorelines now manifest themselves as benches of sands and gravels throughout the lower valleys of the basin. The highest and often the most prominent is the Bonneville Bench at elevation 5200. At its peak 15,000 years ago, Lake Bonneville covered nearly 20,000 square miles of the West Desert Basin. In the last 10,000 years, the Great Salt Lake has been more than 60 feet deeper than it is now and it may have dried up completely on more than one occasion. The fluctuations of the lake attest to the fickle nature of the climate of the West Desert Basin. The marshes and pickleweed barrens around the lake have provided a productive resource for nomadic peoples since about 8,000 years ago.

3.4.1 Past Water Development

Tooele and Rush valleys were used as a herd ground for cattle in 1847 and 1848 . In September of 1849, the first white settlers came into Tooele Valley and settled south of the present site of Tooele. The Grantsville area was settled the following autumn. Because the basin's mountain streams disappear into the valley sediments once they emerge from the canyons, early pioneers settled near the mouths of the canyons and diverted stream flows for irrigation and domestic uses. By 1870, the agricultural crops raised in Tooele County consisted of 1,000 acres of meadow hay with a total production of 1,538 tons, and 1,062 acres of wheat with a yield of about 26 bushel per acre and approximately 100 acres of assorted peach, apple, sorghum, grape, carrot and beet crops.

Rosebud Reservoir, with 18 acre-feet of storage, was the basin's first reservoir, built in 1869 by the Southern Pacific Railroad Company in the south Park Valley area. In 1880, Warm Springs Reservoir with 90 acre-feet of storage was built in the Park Valley area for irrigation. In 1900, the basin's largest reservoir, Pruess Lake, was built in South Snake Valley just south of Garrison. Water from Pruess Reservoir is used to irrigate lands in and around Garrison, Utah, and lands near Baker, in the Nevada portion of the Snake Valley.

In 1904, the Blue Creek Irrigation Company built Blue Creek Dam. This dam was modified, enlarged and repaired with funds from the Utah Board of Water Resources in 1949, 1967 and 1986 respectively. Currently, Blue Creek Reservoir has the capacity to store 2,185 acre-feet of irrigation water. In 1928, the 176 acre-foot Atherley Reservoir was built in Rush

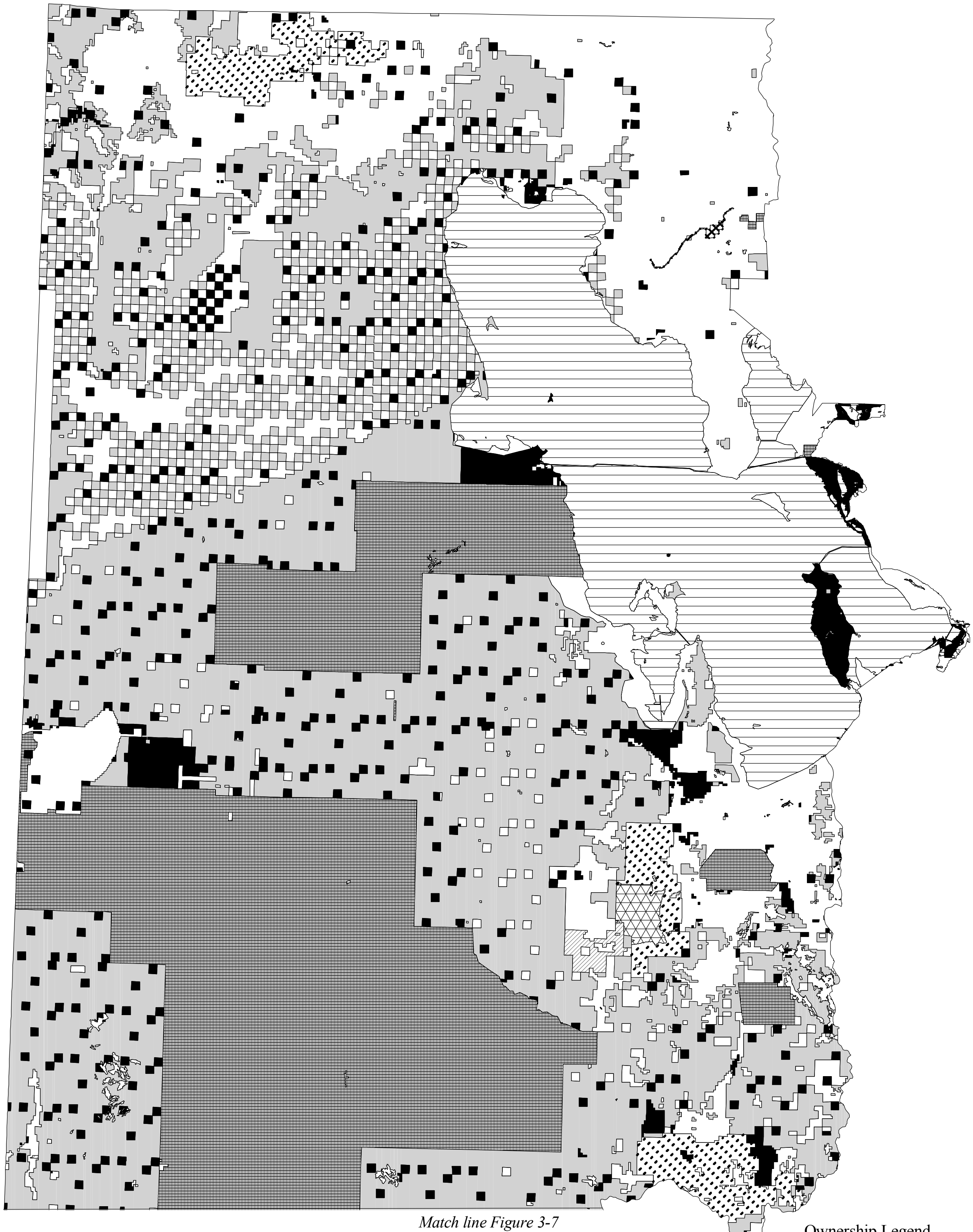
Table 3-5

LAND OWNERSHIP AND ADMINISTRATION

West Desert Basin

(acres - by county)

	Box Elder	Tooele	Juab	Millard	Beaver	Iron	Weber	Davis	Salt Lake	Total
Private	1,567,570	568,120	20,380	22,530	8,700	22,740	15,890	19,680	0	2,245,610
State:										
Land (excluding Great Salt Lake)	189,160	253,330	100,080	153,060	61,130	9,470	15,700	33,030	0	814,960
Great Salt Lake	641,100	181,760	0	0	0	0	50,280	221,400	15,440	1,109,980
Federal										
BLM	1,039,010	1,885,510	744,510	1,256,310	420,090	70,740	0	370	0	5,416,540
Forest Service	71,870	117,640	0	55,500	0	0	0	0	0	245,010
Military	216,300	1,573,800	0	0	0	0	1,040	0	0	1,791,140
National Parks	2,260	0	0	0	0	0	0	0	0	2,260
Wildlife Reserve	20	310	17,990	0	0	0	0	0	0	18,320
Wilderness	0	21,710	0	0	0	0	0	0	0	21,710
Indian Reservation	0	17,310	33,860	0	0	0	0	0	0	51,170
Total Federal Lands	1,329,460	3,616,280	796,360	1,311,810	420,090	70,740	1,040	370	0	7,546,150
Total	3,727,290	4,619,490	916,820	1,487,400	489,920	102,950	82,910	274,480	15,440	11,716,700



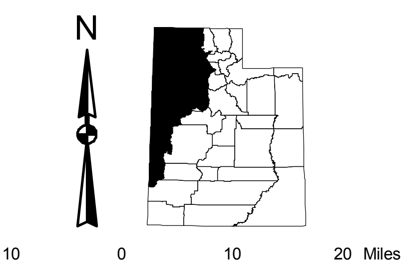


Figure 3-6

LAND OWNERSHIP

West Desert Basin
(Northern Portion)

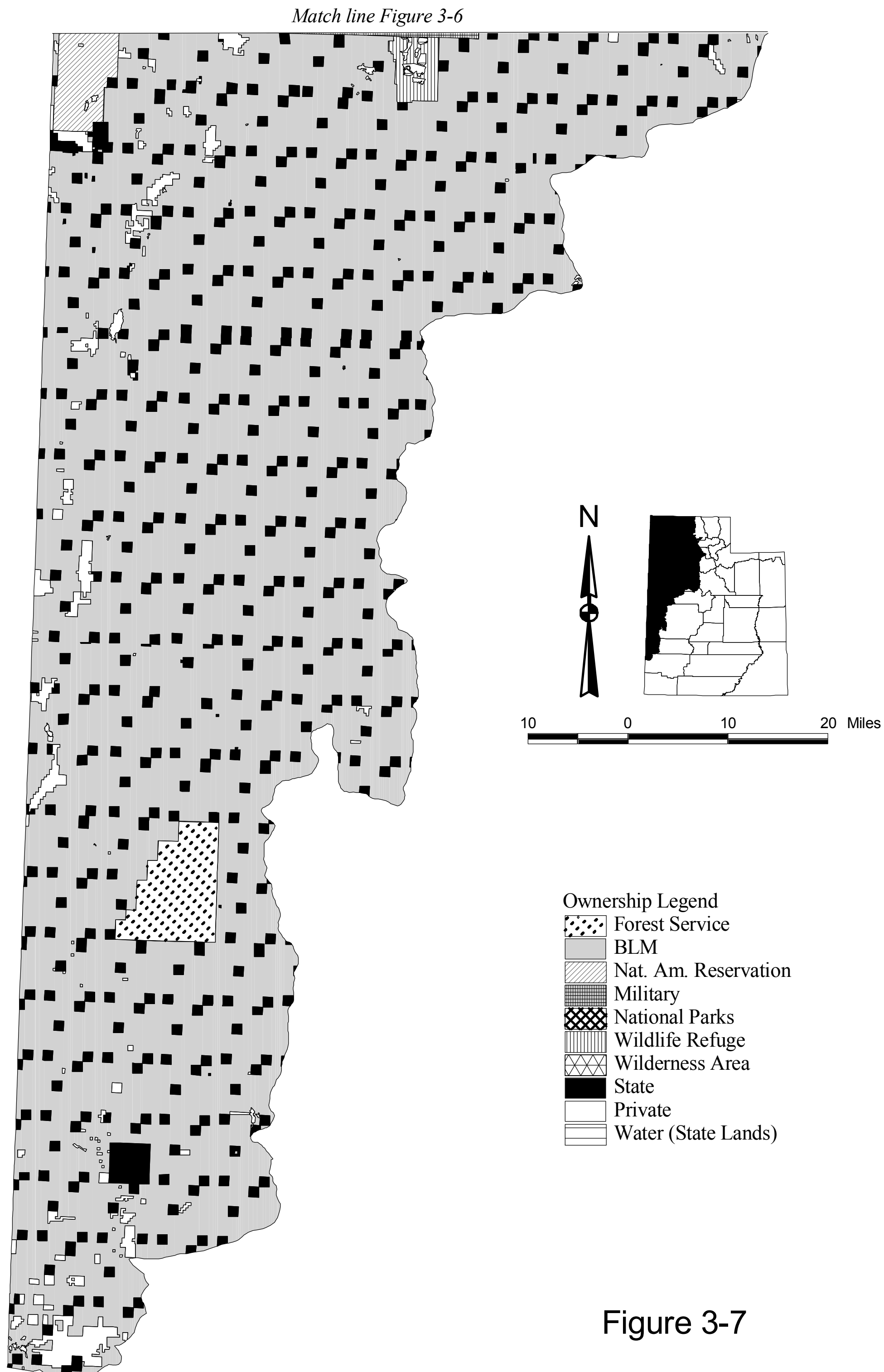


Figure 3-7

LAND OWNERSHIP

West Desert Basin
(Southern Portion)

Valley. Atherley Reservoir is currently owned by the Utah Division of Wildlife Resources. Mormon Gap Reservoir, built in 1939, has a capacity of 90 acre-feet and is owned by the Bureau of Land Management. In 1940, the 186 acre-foot Granite Creek Reservoir was constructed southeast of Callao. In 1947, Wrathal-Johnson Reservoir, with 227 acre-feet of storage capacity was built in Tooele Valley northeast of Grantsville. In 1953, the Bar B Ranch Reservoir (82 acre-feet) was constructed in the Promontory mountains area. The Bar B Ranch Reservoir is now owned by Thiokol Corporation.

Thiokol Corporation

In 1959, the Utah Board of Water Resources funded the construction of 1,471 acre-foot Etna Reservoir. Etna Reservoir is owned by the Irrigation Company of the West Fork of Grouse Creek. In 1960, the Death Creek Irrigation Company, with funds from the Board of Water Resources, built the 228 acre-foot Death Creek Reservoir in the Etna/Grouse Creek area.

Rose Ranch Reservoir, with a 300 acre-foot capacity, was built in 1963 in the Snowville area. In 1966, Settlement Canyon Reservoir (1,168 acre-feet) was constructed by the Settlement Canyon Irrigation Company with funds from the Soil Conservation Service and the Board of Water Resources. The dam, located one half mile above the mouth of the canyon, is 105 feet high and impounds 1,168 acre-feet of water. Repairs to Settlement Canyon Dam were

Etna Reservoir

performed with Board of Water Resources funds in 1985.

In 1967, the Blue Creek Irrigation Company constructed the 385 acre-foot Dejarnatt Reservoir just north of the Blue Creek Reservoir. In 1973, Vernon Irrigation Company used funds from the Soil Conservation Service and the Board of Water Resources to construct the 560 acre-foot Vernon Reservoir. Sandarosa Reservoir, a 3,750 acre-foot reservoir owned by Signa Investment Inc., was constructed in 1982 just west of Snowville.

The Vernon project which includes the 560 acre-foot reservoir and a collection pipeline and two distribution pipelines was built in 1976 to regulate and control erosion and sedimentation and provide irrigation water. The project was sponsored by the Vernon Soil Conservation District, the Vernon Irrigation Company and Tooele County. In addition to the construction of a reservoir and irrigation distribution systems the project included the following land treatments to reduce erosion: land leveling, conservation cropping systems, contour trenching, contour furrowing, brush spraying, juniper removal, seeding, gully plugs, stream bank stabilization, fencing and resource management.

Grantsville Irrigation Company constructed its 3,370 acre-foot Grantsville Reservoir in 1984 with Board of Water Resources funds. Stateline Creek, a 205 acre-foot reservoir in Hamlin Valley was built in 1984 and modified in 1992.

In addition to the listed reservoirs, there are two small regulating ponds (Grantsville and Tooele Army Depot), and a couple of large tailings ponds in the basin: Kennecott Anaconda, a 3,919 acre-foot tailings pond, and Barrick Mercur, a 6,626 acre-foot tailings pond. Both of these are located in the Tooele/Rush Valley on the western slopes of the Stansbury mountains. See Table 6-1 Existing Reservoirs and Figure 6-1 Existing Reservoirs.

Contents

Section 4

West Desert Basin

DEMOGRAPHICS AND ECONOMIC FUTURE

4.1 INTRODUCTION

While much of the state was settled as destination communities during the early settlement of Utah, much of the West Desert Basin was considered undesirable. The Donner Party left wagon tracks through the area as they journeyed toward the Sierra Nevada Mountains. Bones, wagon parts and grave sites marked the passage of dreamers through the mud holes, salt flats, and other desert obstacles. This desert is less inhospitable in today's technological society.

Much of the terrain throughout the basin is either too rugged, too dry or too saline to attract large numbers of settlers or entrepreneurs. Aside from the Tooele Valley, which has in the past decade experienced significant growth, and is expected to continue growing, it is unlikely the basin will see large population increases in the foreseeable future.

Garrison, Utah

4.2 POPULATION

Although the basin is comprised of parts of six counties, only four of these counties have residents within the basin boundaries. The portions of Beaver and Iron counties within the basin do not have any residents. In 1996, just under 32,000 people were permanent residents in the basin.

That number is expected to increase to 38,500 by the year 2000, and to about 68,200 by 2020. This is an increase of almost 36,500 people or roughly 115 percent over the 24 year period. The annual rate of population growth is approximately 2.8 percent. As shown in Table 4-1, the small part of Utah located in the Columbia River Basin was home to 50 people in 1996 and is expected to grow to about 63 in 2020. The portion of Box Elder County situated in this basin was inhabited by 1,170 people in 1996, while at the same time Tooele County was home to 30,100. The basin's population for these two counties is expected to increase to 1,660 and 65,850 respectively by 2020. Juab and Millard counties had 275 and 165 people respectively in 1996 and should increase to 430

> The West Desert Basin is one of the most sparsely populated areas; not only of Utah but of the Intermountain West. Tooele City, with 20,300 people, is the largest city in the entire basin. Grantsville is the second most populous community with 5,900. This section discusses the population, employment and economic future of the West Desert Basin.

Table 4-1
POPULATION PROJECTIONS
West Desert Basin

Cities/Towns	1996	2000	2020
Box Elder County[2]			
Columbia River Basin			
Clear Creek, Lynn, Standrod, & Yost	50	53	63
Great Salt Lake Desert Basin[2]			
Blue Creek	10	11	13
Howell	260	270	440
Hansel Valley	20	21	25
Grouse Creek / Etna	100	105	127
Park Valley / Rosette	160	168	203
Promontory	100	105	127
Snowville*	270	277	407
Other unincorporated areas	200	210	255
Box Elder County Total	1,170	1,220	1,660
Tooele County			
Incorporated Cities and Towns[1]			
Grantsville*	5,200	5,935	9,373
Ophir*	30	38	67
Rush Valley*	367	472	625
Stockton*	467	606	775
Tooele*	14,996	20,267	33,690
Vernon*	200	239	482
Wendover*	1,190	1,293	1,688
Total for Incorporated Cities and Towns	22,450	28,850	46,700
Unincorporated Areas[2]			
Dugway	1,530	1,530	1,700
Erda[3]	2,140	2,250	2,920
Gold Hill	10	11	13
Ibapah	60	63	95
Lincoln[3]	280	295	480
Lake Point	310	326	785
Stansbury Park[3]	3,000	3,158	6,790
Terra	110	116	235
Skull Valley Indian Reservation	60	63	75
Other Unincorporated Areas	150	158	6,057
Total for Unincorporated Areas	7,650	7,970	19,150
Tooele County Total[1]	30,100	36,820	65,850
Juab County			
Callao	50	55	78
Fish Springs	5	10	12
Goshute Indian Reservation	110	120	174
Partoun	100	104	150
Trout Creek	10	11	16
Juab County Total[2]	275	300	430
Millard County			
Eskdale	85	95	137
Garrison	50	53	64
Robinson's Ranch	30	32	39
Millard County Total[2]	165	180	240
Basin Totals	31,710	38,520	68,180

* Incorporated Towns
Source: 1) Demographic and Economic Analysis, Governor's Office of Planning and Budget, August 1995
2) County Estimate
3) Estimate based upon existing water use data. 2020 population projections for Erda and Lincoln are limited by existing water supplies.

and 240. See Figures 4-1a and 4-1b for a graphic perspective of population changes in the four basin counties. Portions of Beaver and Iron counties lie in the basin but no people reside in these areas.

4.3 EMPLOYMENT

The basin's employment base is centered in Tooele Valley and the salt, mineral and brine related industries located near the Great Salt Lake. Agriculture in Tooele County is expected to lose jobs gradually, while mining jobs will increase slowly. Construction, manufacturing, TCPU (transportation - communication and public utilities) and governments jobs will all increase between 30 percent and 60 percent by the year 2020. High growth sectors for the same period of time are trade (78 percent), FIRE (finance, insurance and real estate) (73 percent), services (106 percent), and non-farm proprietors (91 percent). Lake related jobs total 1,325, mostly in salt, mineral and brine shrimp production. Table 4-2 and Figure 4-2 show the dramatic drop in government jobs in Tooele County associated with federal defense employment cutbacks in the early 1990s. Non-farm proprietors, services, and trade are also shown in Figure 4-2.

The Governor's Office of Planning and Budget's employment projections are by county. Consequently it is not meaningful to show Box Elder, Millard, or Juab counties' employment projections since the West as the vast majority of residents in these counties reside outside the West Desert Basin.

4.4 ECONOMIC FUTURE

Economic projections are made using the Utah Process for Economic and Demographics (UPED) projection model taking into account a number of variables assessing the demographic and industrial mix of an area's overall economy. The model incorporates historic employment growth rates into future growth patterns along with assumptions regarding labor force survival rates. The transient and part-time population occupying the relatively small number of hotel rooms and condominiums at regional recreation and tourist areas are not accounted for in the UPED model. As in most areas of the state, service and trade sectors will be the leading sources of jobs with government employment growing at about the rate of population increases. Industries located on the Great Salt Lake are expected to continue providing employment to Wasatch Front and basin residents.

Stansbury Park, Tooele County

Figure 4-1a

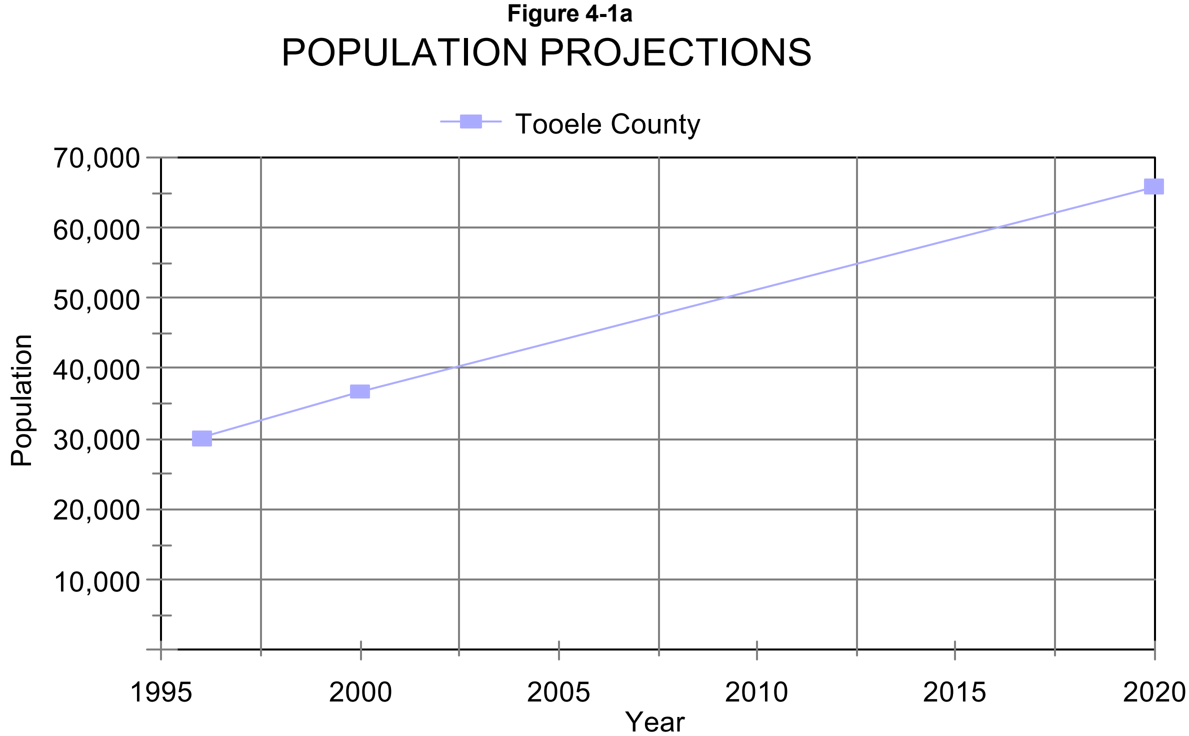


Figure 4-1b

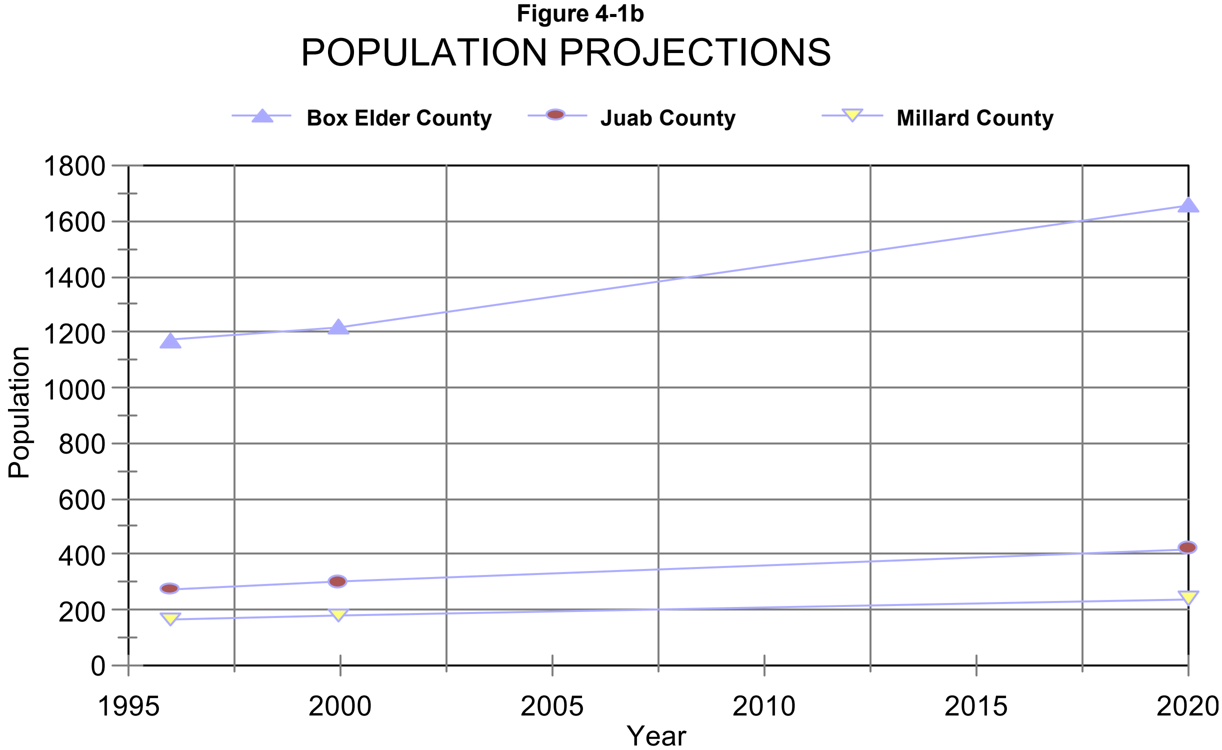
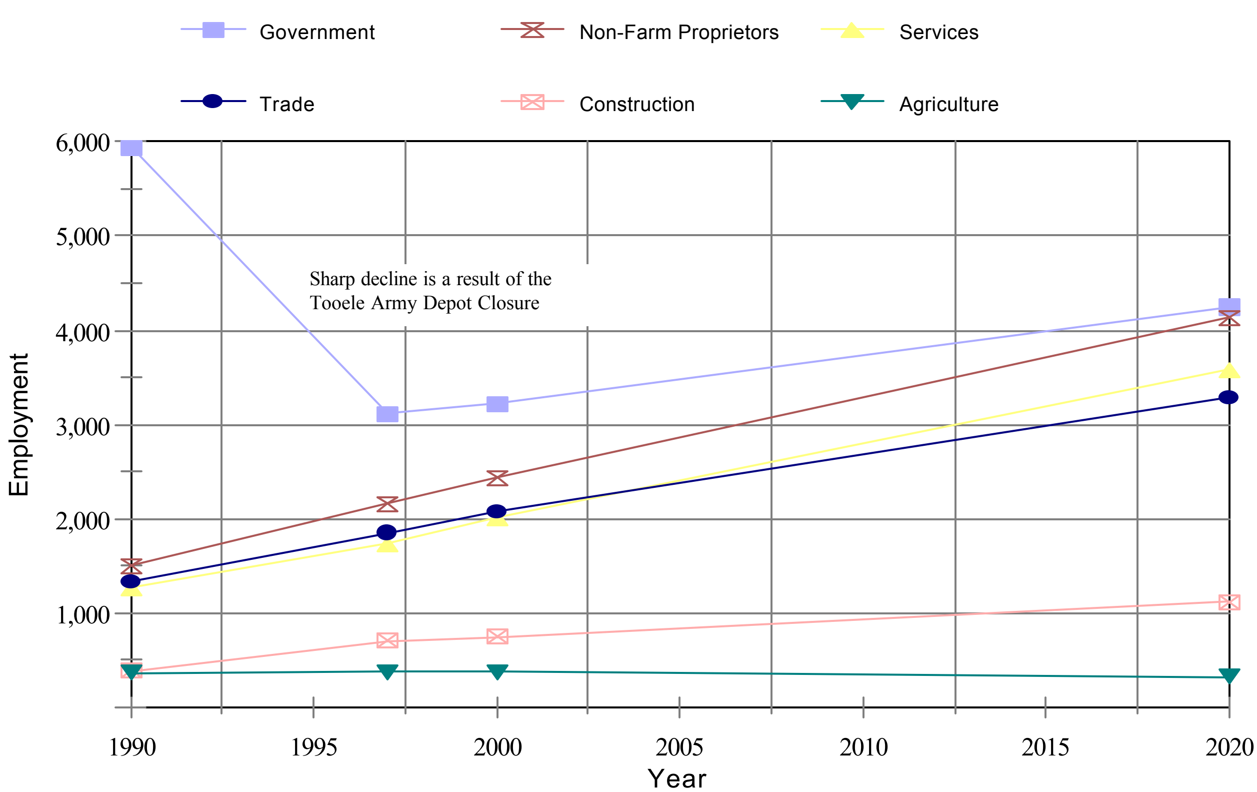


Table 4-2 **EMPLOYMENT PROJECTIONS (Tooele County)**					
Sector	1990	1997	2000	2020	% Change (1997-2020)
Agriculture	372	380	377	328	-13.68
Mining	229	219	225	250	14.16
Construction	391	709	750	1,122	58.25
Manufacturing	1,008	1,420	1,671	1,897	33.59
TCPU[1]	256	2,087	2,223	3,098	48.44
Trade	1,335	1,850	2,074	3,288	77.73
FIRE[2]	134	220	251	380	72.73
Services	1,265	1,737	2,016	3,584	106.33
Government	5,939	3,115	3,226	4,251	36.47
Non-Farm Proprietors	1,505	2,163	2,443	4,132	91.03
County Total	12,434	13,900	15,256	22,330	60.65

1. Transportation, Communication and Public Utilities
2. Finance, Insurance and Real Estate.

Figure 4-2
EMPLOYMENT PROJECTIONS (Tooele County)



Contents

Section 5

West Desert Basin

Utah State Water Plan

WATER SUPPLY AND USE

5.1 INTRODUCTION

This section discusses historical flows, developed water supplies and present water use in the West Desert Basin. The West Desert Basin is a very dry environment and most of its streams are intermittent and ephemeral. Consequently, surface water sources have not been developed for municipal and industrial uses, although some have been developed for agricultural uses. There is a great reliance on groundwater throughout the basin particularly for municipal and industrial uses. Throughout the basin, groundwater is used not only to supplement surface water supplies in the late summer but in many locations it is the primary irrigation water source.

5.2 BACKGROUND

The base period in this report for determining the surface water supplies is water years 1941 through 1990. Some of the groundwater recharge and discharge data are discussed for different time periods, depending upon the reports used and the period of record available. Water budget data is based on the period 1961-1990 and the municipal and industrial water data is for 1996. Surface water and groundwater data are provided primarily by the U.S. Geological Survey.

Throughout the basin, most streams run intermittently. One exception is Goose Creek, which is a perennial stream in the Columbia River basin and passes through the extreme northwest corner of the state. Another exception is Blue Creek. A few other mountain streams can be classified as perennial in their upper reaches. But, even these streams tend to disappear into the alluvial and colluvial fans as they leave the canyons and enter the broad desert valley floor. Consequently, most of the basin's streams do not yield a dependable supply of surface water. Many of these drainages can, however, experience short duration flows produced by high intensity cloudburst storms and/or heavy snow-melt runoff.

The West Desert Basin includes some of the most arid lands in the western United States. Surface water sources are scarce and most often intermittent. Consequently, residents of the basin have come to rely heavily upon groundwater resources.

Historically, the primary use of surface water has been for irrigation. The first permanent residents in the West Desert Basin settled near the present day city of Tooele in the fall of 1849. Irrigation system development was one of the first activities undertaken by the early settlers. Culinary supplies originally came from surface water or nearby springs. Later, wells were dug and springs were improved to provide good quality culinary water for growing communities.

Land use inventories cover the lower valley areas where the agricultural croplands and most of the cities and towns are located. The land use was inventoried from aerial photography and field mapping conducted in 1989. This data was used for the current water budgets. The water budget is an accounting of water supplies, uses and outflows for a given sub-basin. These water budgets are based on the 30-year period (1961-1990).

5.3 WATER SUPPLY

The West Desert Basin does not have an abundant water supply. The erratic nature of the winter snows can easily double the annual snowpack or cut it drastically during mild winters. This results in a significant fluctuation in the surface water runoff.

Groundwater is similarly affected over a delayed period of time. There is a direct relationship between the surface water flows and the groundwater. Surface water recharge is the primary supply for the groundwater aquifer. Table 5-1 gives the existing surface and groundwater supplies for the sub-basins as found in the most recent hydrologic studies.

5.3.1 Surface Water

The U.S. Geological Survey (USGS) currently maintains five streamflow gaging stations in the West Desert area at widely scattered points, as shown in Figure 5-1. In addition to the existing USGS stations, there are additional sites that have been monitored on a temporary basis. Although no longer in use, these discontinued stations are a valuable source of streamflow data. See Table 5-2 for existing and discontinued gaging stations.

Throughout the basin, most streams tend to run intermittently with most of the surface water runoff coming from snow-melt during the months of April, May and June. Even when streams flow heavily in their mountainous regions, their flows tend to disappear when the stream emerges from the canyon, crosses the alluvial fan, and spreads out onto the broad valley floor. Consequently there are no significant rivers in the basin.

Raft River Mountains

To facilitate the discussion of water related issues and concerns, the Basin has been divided into four sub-basins: Box Elder County, Tooele/Rush Valley, the Great Salt Lake Desert and the Great Salt Lake (see Figure 3-2). The Columbia River Basin is included as part of the Box Elder sub-basin, however, when appropriate, issues pertaining solely to the Columbia River Basin will be discussed independently.

<u>Box Elder County Sub-basin</u>

The Box Elder County Sub-basin includes most of Box Elder County, excluding only Bear River Valley which is in the Bear River Basin. Western Box Elder County is a sparsely populated rural setting with half a dozen small towns of 100 to 200 people and a few smaller communities. The only incorporated town is Snowville. The basin can be further divided into five areas: the Columbia River Basin, Grouse Creek Valley, Park Valley, Curlew Valley and Promontory.

The Columbia River Basin includes 250,000 acres in the extreme northwest corner of the state, draining the north slope of the Goose Creek Mountains and the north slope of the Raft River Mountains. Hardesty Creek, with its headwaters in the Goose Creek Mountains, flows into Goose Creek which in turn flows into the Snake River near Burley, Idaho. The Raft River, with its headwaters in the Raft River

Table 5-1
TOTAL AVAILABLE WATER RESOURCES
West Desert Basin
Average Annual
(ac-ft/yr)

Sub-Basin	Surface Water	Groundwater	
		Recharge	Net Available*
Box Elder County			
Columbia River Basin[1]	40,800	N.D.	N.D.
Grouse Creek[2]	7,000	14,000	2,700‡
Park Valley[3]	11,000‡	29,000	<17,000
Curlew Valley[4]	2,000	40,000	30,000‡
Hansel Valley[5]	5,000	8,000	0
Promontory[6]	6,000	12,000	7,000‡
Blue Creek Valley[7]	7,200	14,000	2,200
Tooele-Rush Valley[8]	43,250	89,250	10,000
Great Salt Lake Desert			
Great Salt Lake Desert[9]	10,000	84,000	66,000
Dugway Valley[10]	0	12,000	8,000
Fish Springs Flat[11]	0	35,000	<1,000
Deep Creek Valley[12]	7,500‡	17,000	3,000
Snake Valley[13]	7,500‡	105,000	32,000
Tule Valley[14]	4,000	7,600	0
Pine Valley[15]	500	21,000	14,000
Skull Valley[16]	32,000	32,000	2,000

* Net Available Groundwater is the recharge minus the estimated evapotranspiration for the sub-basin area.
‡ Water Resources water related land use inventories and unpublished water budgets have revealed flows higher than had previously been estimated in Hydrologic Tech Pubs.
N.D.: No Data or Insufficient Data
1: Unpublished Water Budget of Columbia River Basin, June 1998.
2: Hydrologic Reconnaissance of Grouse Creek Valley, Tech Pub 29, Department of Natural Resources, 1970
3: Hydrology of Park Valley, Division of Water Resources, April 1984
4: Hydrologic Reconnaissance of Curlew Valley, Tech Pub 25, Department of Natural Resources, 1969
5: Hydrologic Reconnaissance of Hansel Valley, Tech Pub 33, Department of Natural Resources, 1971
6: Hydrologic Reconnaissance of Promontory Mountains, Tech Pub 38, Department of Natural Resources, 1972
7: Hydrologic Reconnaissance of Blue Creek Valley, Tech Pub 37, Department of Natural Resources, 1972
8: Shambip River Basin Study, U.S. Soil Conservation Service with the U.S. Department of Agriculture, Soil Conservation Commission, & Utah Dept of Natural Resources (Surface water figure has been modified to reflect current data.)
9: Hydrologic Reconnaissance of Southern Great Salt Lake Desert, Tech Pub. 71, Dept. of Natural Resources, 1981
10: Hydrologic Reconnaissance of Dugway Valley, Tech Pub. 59, Department. of Natural Resources, 1978
11: Hydrologic Reconnaissance of Fish Springs Flat Area, Tech Pub. 64, Department. of Natural Resources, 1978
12: Hydrologic Reconnaissance of Deep Creek Valley, Tech Pub. 24, Department. of Natural Resources, 1969
13: Hydrologic Reconnaissance of Snake Valley, Tech Pub. 14, Department. of Natural Resources, 1965
14: Hydrologic Reconnaissance of Tule Valley Drainage Basin, Tech Pub. 56, Dprt. of Natural Resources, 1977
15: Hydrologic Reconnaissance of Pine Valley Drainage Basin, Tech Pub. 51, Dprt of Natural Resources, 1976
16: Hydrologic Reconnaissance of Skull Valley, Tech Pub. 18, Department. of Natural Resources, 1968

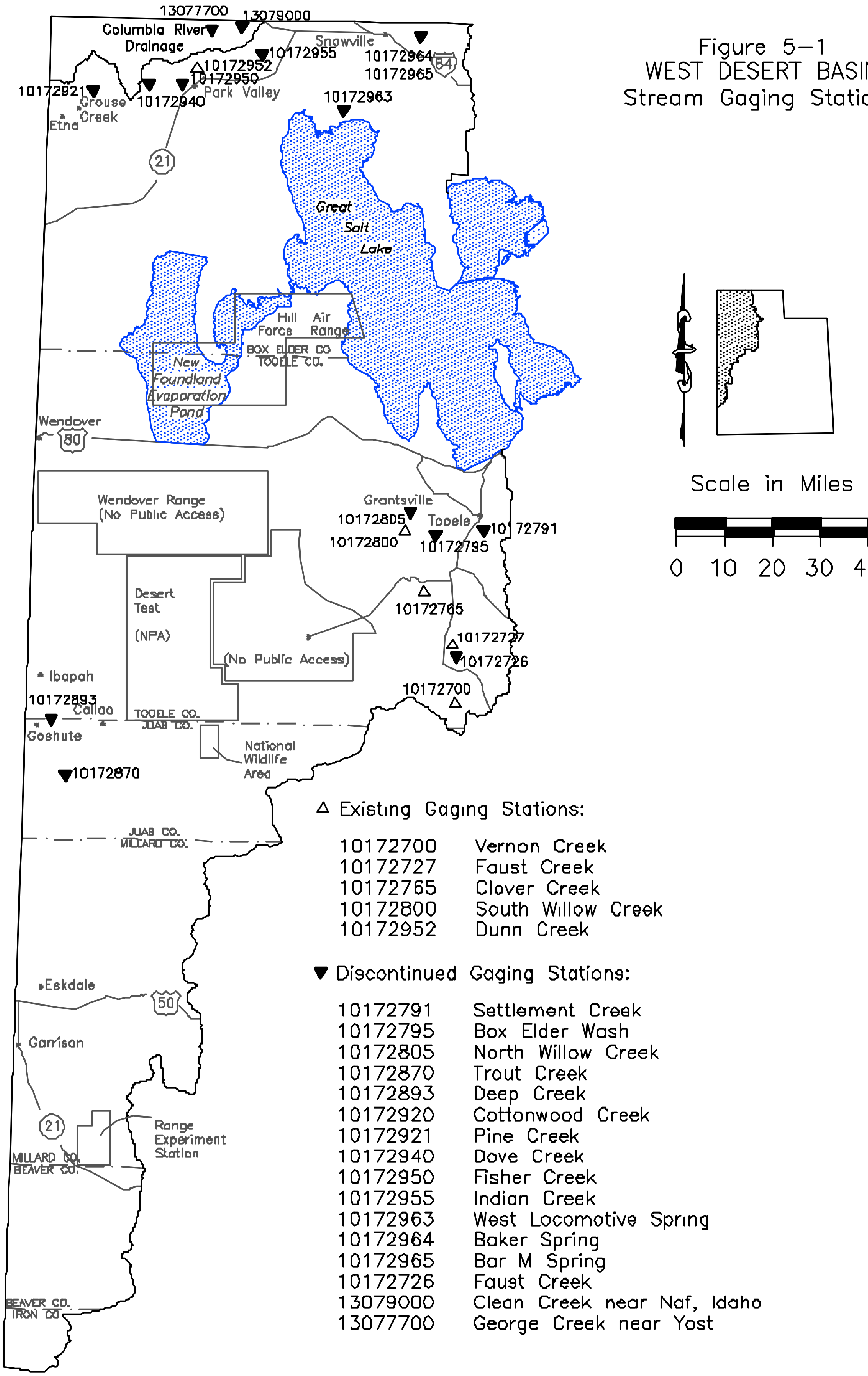


Figure 5-1
WEST DESERT BASIN
Stream Gaging Stations

Table 5-2
STREAMFLOW GAGING STATIONS
West Desert Basin

Number	Description	Average Annual Flow	Years of record
Existing Gaging Stations:		(acre-feet)	
10172700	Vernon Creek in Rush Valley	2,780 (1959-1991)	1958 to present
10172727	Faust Creek near Vernon	1,700 (1991-1995)	1991 to present
10172765	Clover Creek above Big Hollow Creek	2,440 (1986-1991)	1984 to present
10172800	South Willow Creek near Grantsville	4,850 (1964-1991)	1963 to present
10172952	Dunn Creek near Park Valley	4,150 (1972-1991)	1971 to present
Discontinued Gaging Stations:			
10172791	Settlement Creek above Reservoir		1988-98
10172795	Box Elder Wash near Grantsville		1986-94
10172805	North Willow Creek		1979-92
10172870	Trout Creek near Callao		1959-95
10172893	Deep Creek near Goshute		1964-68
10172903	Great Salt Lake West Pond near Wendover, Ut		1987-89
10172920	Cotton Creek Near Grouse Creek		1972-73
10172921	Pine Creek near Grouse Creek		1972-73
10172940	Dove Creek near Park Valley		1959-73
10172950	Fisher Creek near Park Valley		1972-73
10172955	Indian Creek near Park Valley		1971-73
10172963	West Locomotive Spring near Snowville		1969-73
10172964	Baker Spring near Snowville		1969-73
10172965	Bar M Spring near Snowville		1969-80
10172726	Faust Creek (Seasonal)		1991-96
13079000	Clear Creek near Naf, Idaho		1945-70
13077700	George Creek near Yost		1960-89

Mountains, flows north and is also a tributary to the Snake River approximately 30 miles upstream of Goose Creek.

The Grouse Creek Valley is situated south of the Goose Creek Mountains, and west of the Grouse Creek Mountains and Park Valley. The Park Valley area is located south of the Raft River Mountains and east of the Grouse Creek Mountains. Park Valley receives less than 10 inches of average annual precipitation, the vast majority of which is lost through evapotranspiration. The estimated surface runoff from all streams emptying into Park Valley is 10,800 acre-feet per year, of which an estimated 8,600 acre-feet is currently being diverted for use. The estimated pumped groundwater yield for Park Valley is 6,400 acre-feet. Total diversions are 15,000 acre-feet.

The Curlew Valley drainage basin straddles the Utah/Idaho state line between the Raft River Mountains to the west and the Promontory Mountains to the east. This semi-arid region receives about 14 inches of precipitation annually. The area has only one small perennial stream: Deep Creek which originates in Idaho's Deep Creek Mountains and flows through the Snowville area. Most of Deep Creek's flow is diverted for irrigation in both Utah and Idaho.

The estimated groundwater pumpage in the Utah portion of Curlew Valley is 30,000 acre-feet. Most of the groundwater in the Curlew area flows from the north, from Idaho.

The Promontory area includes the Promontory Mountains which extend as a peninsula into the Great Salt Lake, along with Hansel Valley to the west of the Promontory Mountains and Blue Creek Valley to the east. Annual precipitation for the area ranges from 12 to 20 inches.

The majority of the population for the area lives in the Blue Creek Valley which has significantly more water than the Hansel Valley area. Hansel Valley is estimated to have a total surface water flow of less than 1,200 acre-feet and negligible ground water yield. Blue Creek Valley has a surface water yield from the Blue Creek Reservoir of 17,000 acre-feet and an estimated groundwater yield of 600 acre-feet. The Promontory Mountains provide 6,000 acre-feet of surface water runoff and a groundwater supply of 7,000 acre-feet annually.

Tooele/Rush Valley Sub-basin

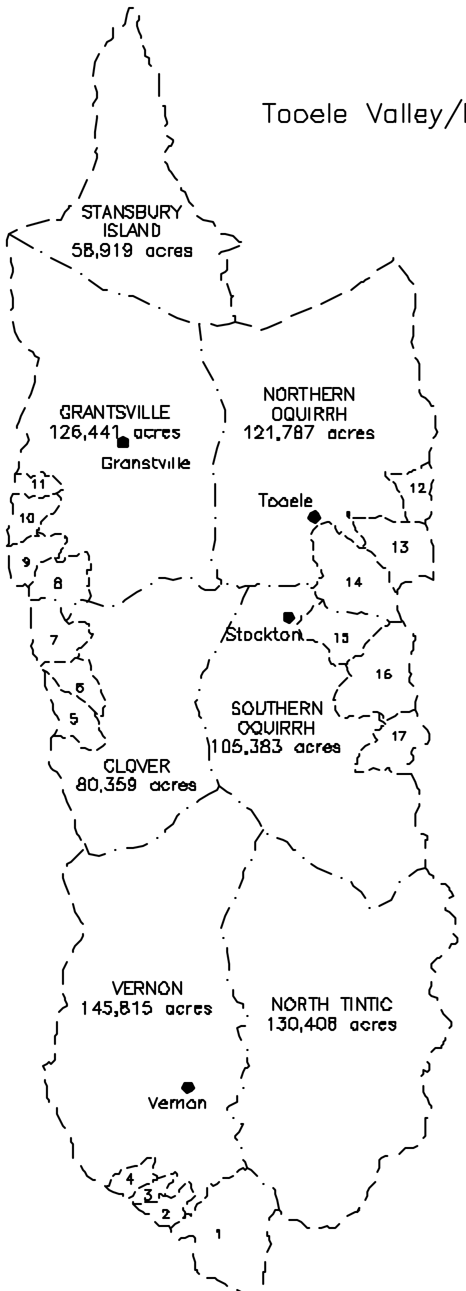
The average annual precipitation of 14.7 inches over the 769,000 acres of Tooele/Rush Valley produces a volume of 941,500 acre-feet (see Table 5-3). Evapotranspiration by native vegetation and phreatophytes is estimated to be 809,000 acre-feet. This leaves an estimated 132,500 acre-feet of water available for use. Annual irrigation diversions, under present cropping and irrigation conditions, require up to 85,400 acre-feet of water. Municipal and industrial water use accounts for 35,370 acre-feet annually. This leaves an estimated 11,730 acre-feet of water that is available to recharge groundwater aquifers or contribute flow to the Great Salt Lake. The valley's six east side canyons (Pine, Middle, Settlement, Soldier, Ophir and Mercur) provide an estimated annual runoff of 19,650 acre-feet. The seven canyons on the west side of the valley (Davenport, North Willow, South Willow, Box Elder, Hickman, Big Hollow and Clover) produce an average of 20,730 acre-feet per year. The four canyons (Harker, Dutch, Bennion, and Vernon) at the south end of Rush Valley produce only 2,870 acre-feet of runoff per year (see Figure 5-2 for canyon locations). Altogether, the Tooele/Rush Valley sub-basin's mountain streams provide an annual average of 43,250 acre-feet.

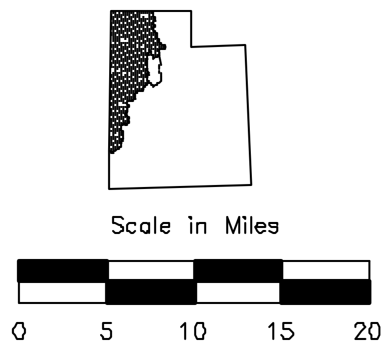
Table 5-3
Tooele Valley/Rush Valley Water Budget By Sub-Area
(acre-feet)

River Basin Sub-Area	Area (acres)	Annual Precip.	Evapo-trans.	Net Available	M.&I.[1] Divers.	Irrig.[2] Divers.	Undev. Supply
Stansbury Island	58,920	48,500	48,400	100	0	0	100
Grantsville	126,440	161,800	123,000	38,800	4,600	31,200	3,000
Clover	80,360	105,600	94,600	11,000	0	10,000	1,000
Vernon	145,820	165,200	146,800	18,400	140	17,500	760
North Tintic	130,410	128,500	127,600	900	50	0	850
Southern Oquirrh	105,380	156,200	150,100	6,100	760	2,700	2,640
Northern Oquirrh	121,790	175,700	118,500	57,200	29,800[3]	24,000	3,400
Totals	769,120	941,500	809,000	132,500	35,350	85,400	11,750

1: Does not include private domestic use outside incorporated areas.
2: Figure shown is total water rights for existing irrigated acres.
3: Includes 10,000 acre-feet of water exported to Kennecott smelter operations.

Figure 5-2
Tooele Valley/Rush Valley Water Budget by Sub-Area
West Desert Basin





	Creek	Discharge (ac-ft/yr)
1	Vernon	2,070
2	Bennion	405
3	Dutch	125
4	Harker	270
5	Clover	3,168
6	Big Hollow	2,030
7	Hickman	2,540
8	Box Elder	3,830
9	South Willow	4,778
10	North Willow	3,205
11	Devenport	1,379
12	Pine	1,430
13	Middle	4,865
14	Settlement	3,700
15	Soldier	2,422
16	Ophir	6,205
17	Mercur	1,028
TOTAL		43,250

Oquirrh Mountains - Settlement Canyon

The Great Salt Lake Desert Sub-basin

The Great Salt Lake Sub-basin includes the Great Salt Lake Desert, Dugway Valley, Fish Springs Flat, Skull Valley, the Deep Creek Mountains, Snake Valley and several uninhabited desert valleys: Pine Valley, Tule Valley and Hamlin Valley.

The Great Salt Lake Desert is essentially barren, saline mud flats or salt flats with little vegetation and is uninhabited except for a few small communities located at the desert's edge. Wendover, the most prominent town, with a population of 1,170, is located on the west edge of the Great Salt Lake Desert. Wendover's growth, economic stability and even its water supply are intricately tied to West Wendover, Nevada. Callao, a small farming community of about 50 people, is located at the south edge of the Great Salt Lake Desert and at the north edge of the Snake Valley. In addition to surface and groundwater flows that move north from Snake Valley to the desert, Callao also receives surface and groundwater from the Deep Creek Mountains directly to the west. Consequently Callao has the appearance of an oasis at the desert's edge with green pastures and some irrigated alfalfa and grain fields and tall trees that can be seen for miles. Also located at the south edge of the Great Salt Lake Desert is Fish Springs Wildlife Refuge. Its location makes it one of the Intermountain West's most important wildlife refuges. Natural springs at the northeast edge of the Fish Springs Range and Fish Springs Flat provide an annual supply of 20,320 acre-feet of water which is used for the refuge's 10,000-acre marsh system.

Skull Valley is situated between the Cedar Mountains and the Great Salt Lake Desert to the west, and the Stansbury Mountains and Tooele Valley to the east. The valley's only residents live on the Skull Valley Indian Reservation and a few scattered ranches at the south end of the valley.

Deep Creek Valley, located just west of the spectacular Deep Creek Range, is home to an estimated 260 residents who live in the town of Ibapah and on the Goshute Indian Reservation. Despite the impressive Deep Creek Mountains, the valley is estimated to receive only about 7,500 acre-feet of surface water runoff and 3,000 acre-feet of groundwater yield annually.

Snake Valley is located to the southeast of the Deep Creek Mountains and straddles the Utah-Nevada state line, stretching south to Hamlin Valley. This valley is home to approximately 330 residents in, Partoun, Trout Creek, Eskdale, Robinson Ranch and Garrison. A primary source of income to the residents of Snake valley is agriculture. The valley's 9,530 acres of irrigated land is watered primarily with groundwater, approximately 16,000 acre-feet. But local irrigators also use an estimated 7,500 acre-feet per year of surface water, much of which comes in short time periods associated with storms or spring runoff. It is estimated that there is another 16,000 acre-feet of groundwater available in the Snake valley area.

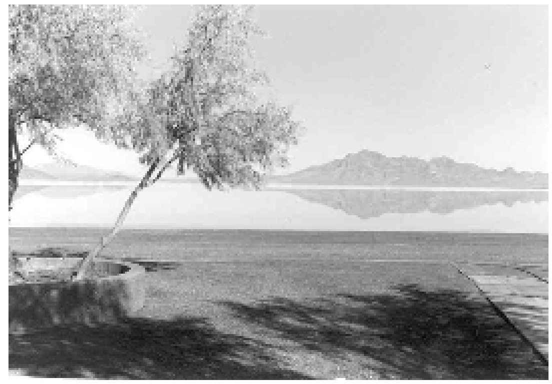
Tule Valley is a closed basin of approximately 940 square miles in western Juab and Millard Counties. It is bounded on the west and north by Snake Valley, and to the east and south by the Sevier River Basin. There is no surface outflow from this uninhabited valley and all streams are ephemeral. An estimated 4,000 acre-feet of surface water flows annually to the center of the basin primarily during periods of storm runoff. This water then either evaporates or seeps into the ground. The valley has an estimated groundwater recharge 7,600 acre-feet per year. Surplus groundwater is believed to flow into Fish Springs Flat where it eventually contributes to spring flows at the Fish Springs Migratory Bird Refuge.

The Pine Valley Drainage is a closed basin at the south end of the basin. Pine Valley is bounded to the east by the Wah Wah Mountains with the Needles Range to the west. The minimum elevation of the surrounding drainage divide is about 5,800 feet. Consequently, Pine Valley was not inundated by ancient Lake Bonneville, though it may have been the site of a contemporaneous closed-basin lake. The vast majority of the valley's 10.6 inches of annual precipitation is lost to evapotranspiration. It is estimated that only 500 acre-feet of surface water runoff reaches the lowest portion of the valley floor. Annual groundwater recharge from precipitation is an average 21,000 acre-feet. However, about 3,000 acre-feet of that moves eastward under the topographic divide into the adjacent Wah Wah Valley and hence into the Sevier Lake drainage basin.

Hamlin Valley is a high mountain valley (6500' elevation) at the upper (southern-most) end of the Snake Valley. Surface runoff from Hamlin Valley is negligible and comes only following a heavy downpour or during the spring thaw following a wet winter season. There is both mining and seasonal grazing in the valley.

5.3.2 Groundwater

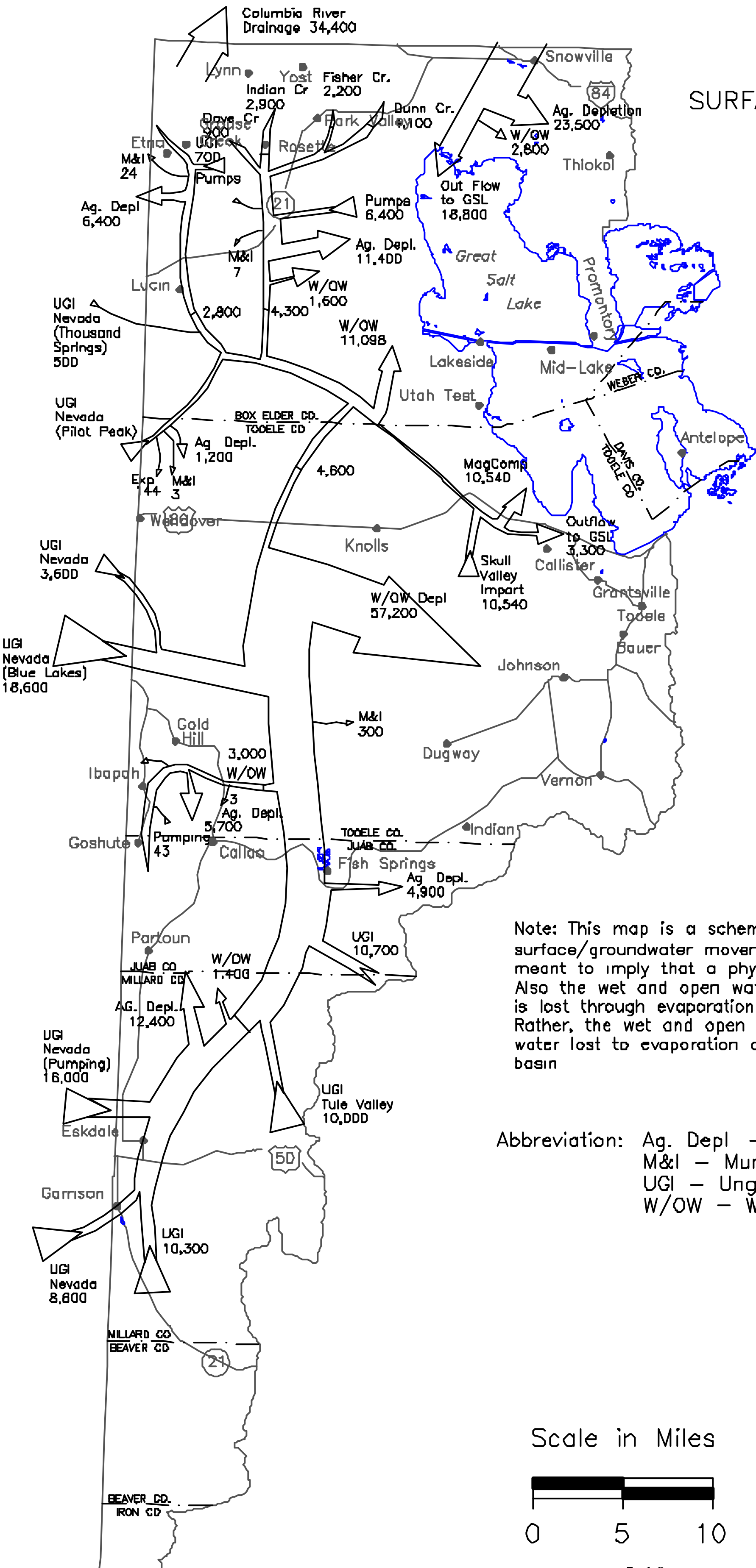
As illustrated by Table 5-1, the scarcity of surface water throughout the West Desert Basin means that residents must rely heavily upon groundwater sources for existing water supplies. With the exception of the Tooele-Rush Valley area and the Columbia River Basin area in west Box Elder County, surface water flows are relatively insignificant when compared to groundwater supplies. Not only are the surface water streams low in volume, but their ephemeral nature means that for much of the year the streambeds are dry. This is true even for many of the Tooele-Rush Valley streams. Consequently, groundwater is the primary source of municipal and industrial water, and is an important secondary source for agricultural water supplies. See Section 19 for further information on groundwater.



Ponded water in the Great Salt Lake Desert

Although the West Desert Basin has no streams which flow perennially to the Great Salt Lake, the general trend of movement of both surface water and groundwater is towards the basin's lowest point, the Great Salt Lake. In periods of high spring runoff or heavy thunderstorms, surface water flows can deliver many hundreds or even thousands of acre-feet of water to localized depressions in the Great Salt Lake Desert. For a period of days or even weeks water can remain as temporary lakes several inches deep and spread over many square miles of the desert floor. Eventually much of this water evaporates, while some seeps into the ground and continues its flow towards the Great Salt Lake. A Surface/Groundwater Budget for the West Desert Basin has been developed from the most current data. This surface/groundwater budget is presented in Figure 5-3. As can be seen from Figure 5-3 very little flow actually reaches the lake. It is estimated that the total surface/groundwater flow from the West Desert to the Great Salt Lake is 3,300 acre-feet. The vast majority of the west desert surface/groundwater is lost through evaporation and evapotransporation and is depicted in Figure 5-3, "Wet and Open Water Depletion." The

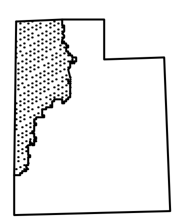
Figure 5-3
SURFACE/GROUNDWATER BUDGET
West Desert Basin
(Acre-ft/year)



Note: This map is a schematic representation of general surface/groundwater movement in the West Desert Basin. It is not meant to imply that a physical streams exist in the locations shown. Also the wet and open water depletion arrows do not imply that water is lost through evaporation and transpiration at those precise locations. Rather, the wet and open water depletion amounts shown represent the water lost to evaporation and transpiration throughout that region of the basin

Abbreviation: Ag. Depl —Agricultural Depletion
M&I — Municipal and Industrial Depletion
UGI — Ungauged Inflow
W/OW — Wet and Open Water Depletion

Scale in Miles
0
5
10



estimated surface/groundwater flow to the Great Salt Lake from the Curlew Valley area is 18,800 acre-feet.

One area of the basin's surface/groundwater budget that may be in question, is the groundwater flow from the Thousand Springs area near Lucin. The 500 acre-feet per year shown on Figure 5-3 is the estimated ungaged surface water flow from the estimated 1,500 square mile drainage area in Northeastern Nevada. An independent study of the area conducted in the 1970's indicated the possibility that a significant groundwater flow may be moving from the Nevada drainage area across the state line and surfacing in the northern end of the Great Salt Lake Desert southeast of Lucin. While this study has yet to be confirmed, it suggests the possibility that several tens of thousands of acre-feet of groundwater may be available in the Lucin area. More exploration and analysis is needed to define this resource.

5.3.3 Great Salt Lake

The Great Salt Lake receives a total annual inflow of just over 3.5 million acre-feet including direct precipitation on the lake. The West Desert Basin contributes just 2 percent of that total (58,000 acre-feet), primarily in the form of sub-surface flow (See Table 5-4). The largest contribution to the Great Salt Lake comes from the Bear River basin, just over 40.5 percent or 1.45 million acre-feet. Direct precipitation on the lake adds 1.0 million acre-feet or 28 percent of the annual inflow, while the Weber River contributes 18 percent (640,300 acre-feet) and the Jordan River adds 12 percent (438,000 acre-feet) of the Great Salt Lake's annual inflow (See Figure 5-4).

Average annual evaporation from the lake is a function of the weather and the surface area of the lake. Generally speaking as the lake increased in size, the evaporation increases. Conversely, as the lake shrinks, so does the evaporation. Consequently, the average annual evaporation from the Great Salt Lake is equal to the average annual inflow. On the short term however, annual inflow and evaporation can be dramatically different. The Great Salt Lake annually rises as the inflow exceeds the evaporation in the winter and spring, and falls as evaporation exceeds inflow in the late summer and early fall. Record keeping of the elevation of the Great Salt Lake commenced in 1951 (See Figure 5-5). Since that time the most dramatic net increase in the Great Salt Lake was experienced in the wet years of 1983 and 1984. In that two year period the Great Salt Lake rose nearly 10 feet, a net increase of nearly 10 million acre-feet.

Mills Junction

5.4 PRESENT WATER USE

Most of the basin's developed water supply is used for agriculture purposes. Other uses are for culinary, secondary and industrial purposes, commonly called municipal and industrial water; and water used by wet/open water areas. An estimated 10,000 acre-feet of water is exported to Salt Lake County by Kennecott Copper Corporation for self-supplied industrial use.

5.4.1 Municipal and Industrial Use

All of the basin's community water systems obtain their culinary water supplies exclusively from groundwater sources (See Table 5-5). The public community water systems for Juab and Millard counties obtain water from wells, while Box Elder and Tooele counties' communities have a mix of well and spring sources for their municipal and industrial water supplies. The basin's community water systems have a total

Table 5-4 **Inflow to the Great Salt Lake** West Desert Basin						
	Bear River	Weber River	Jordan River	West Desert	Precipitation	Totals
Gaged Stream Flow	1,414,000	372,300	363,500	-	-	2,149,800
Ungaged Surface Flow	16,100	109,400	72,000	-	-	197,500
Sub-Surface Flow	20,200	48,600	2,900	58,000	-	129,700
Spills from Willard Bay	-	110,000	-	-	-	110,000
Precipitation	-	-	-	-	1,003,000	1,003,000
Total	1,450,300	640,300	438,400	58,000	1,003,000	3,590,000
Percent of Total	40.5	18	12	1.5	28	100

Table 5-5 **Municipal and Industrial Potable Water Supply** West Desert Basin (acre-feet per year)					
Source	Box Elder	Tooele	Juab	Millard	Total
Community Water Systems					
Springs	120	5,290	0	0	5,410
Wells	850	19,270	20	320	20,460
Surface Water	0	0	0	0	0
Totals	970	24,560	20	320	25,870
Non-Community Water Systems	26	460	4	0	490
Self-Supplied Industrial	700	13,060	0	0	13,760
Private Domestic	160	470	40	20	690
Totals	886	13,990	44	20	14,940
Total M&I Water Supply	1,856	38,550	64	340	40,810

Note: This table only includes potable water sources. Non-potable water supplies are assumed to equal the non-potable water uses shown in Table 5-6.
Source: Municipal and Industrial Water Supply and Uses in Columbia and Great Salt Lake Desert Basins, by Utah Division of Water Resources, July 1998.

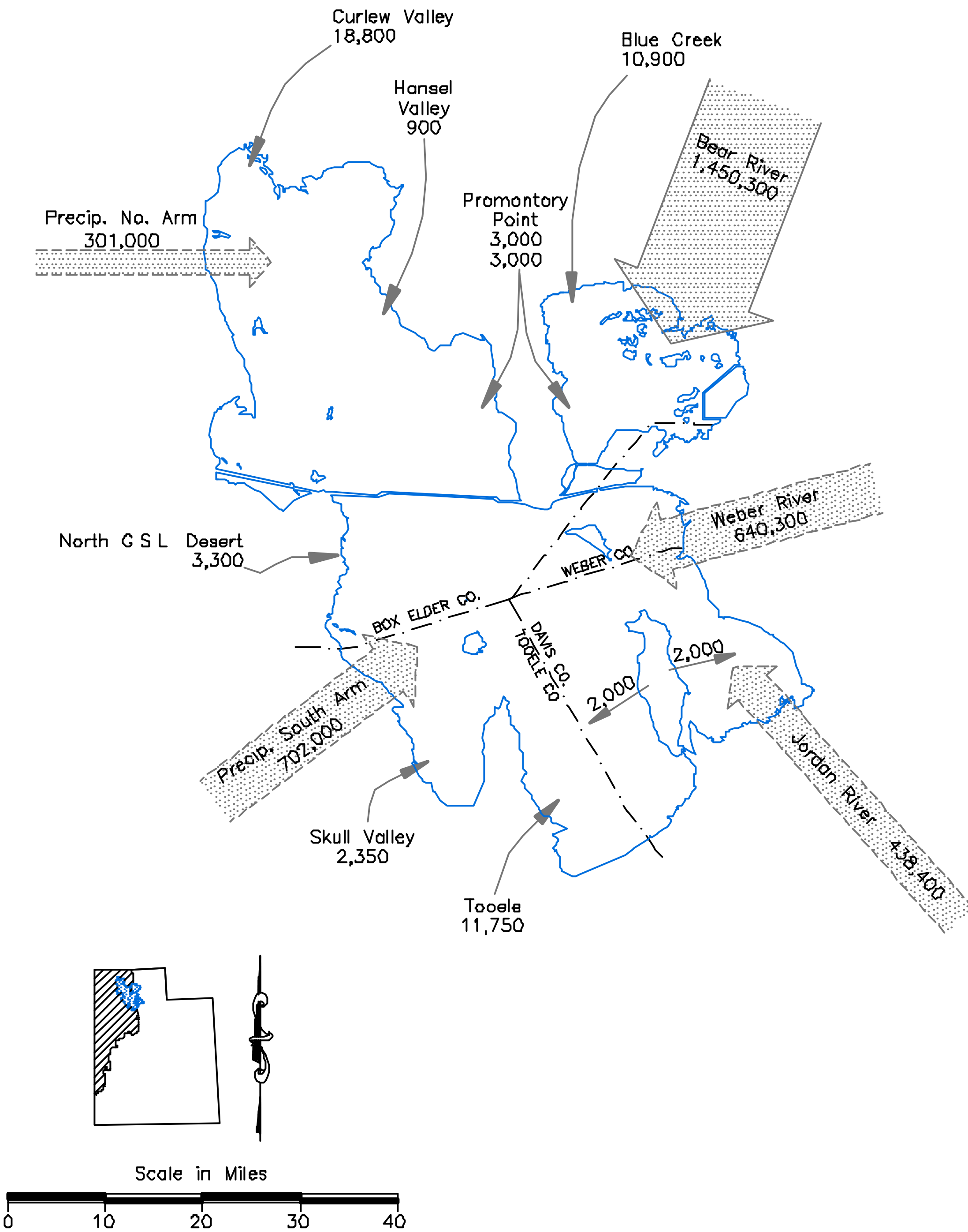
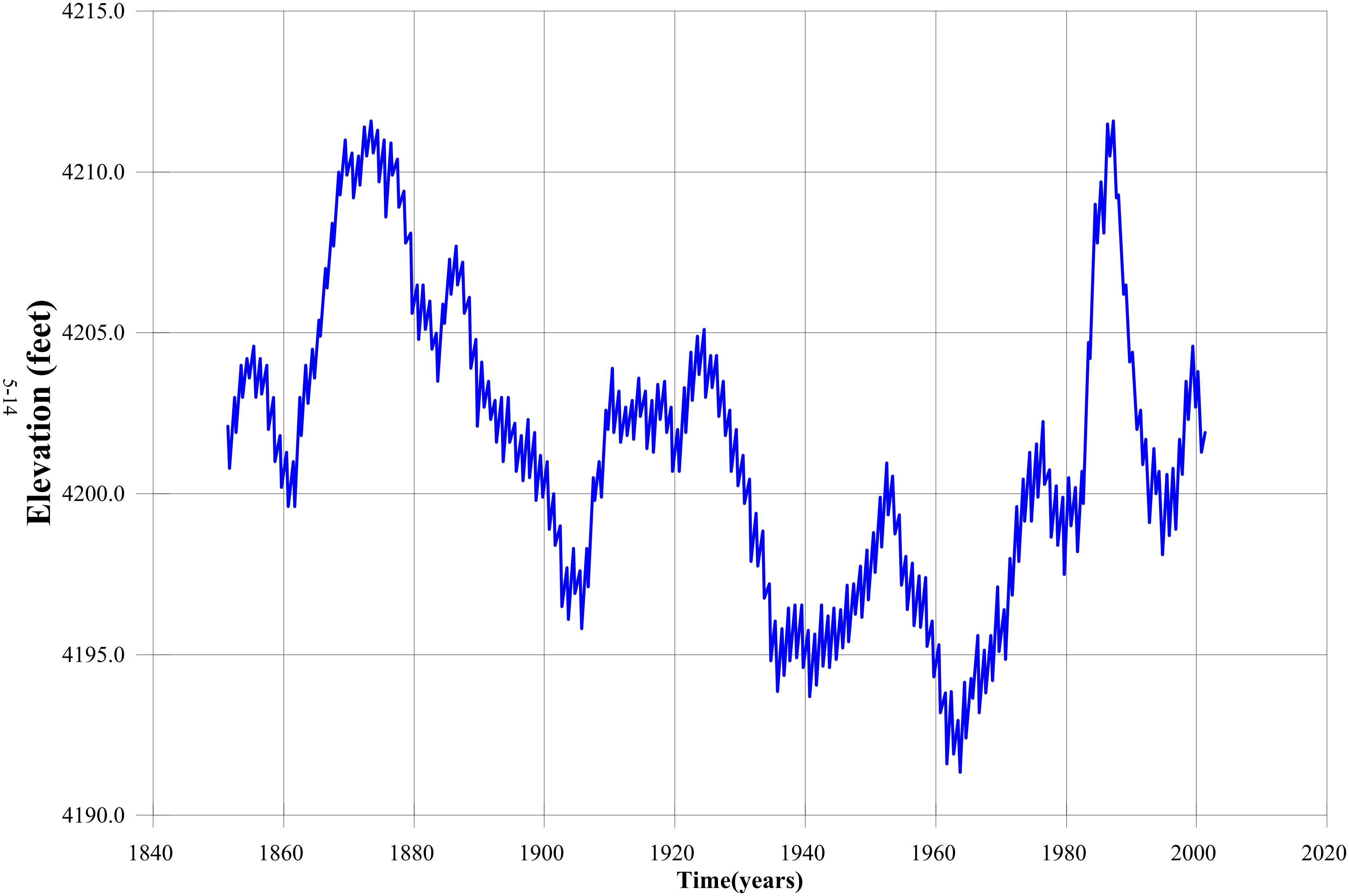


Figure 5–4
GREAT SALT LAKE INFLOW BUDGET
(Surface and Groundwater)

West Desert Basin
(acre–ft/year)

Figure 5-5

HISTORICAL GREAT SALT LAKE HYDROGRAPH



available water supply of 25,870 acre-feet per year. Non-community water systems provide an additional 490 acre-feet per year, while self-supplied industrial sources have 13,760 acre-feet per year. Private domestic systems are estimated to provide users with 690 acre-feet per year. This puts the total municipal and industrial water supply in the West Desert Basin at 40,810 acre-feet per year.

Table 5-6 shows the total culinary use from the basin's community water systems is 7,080 acre-feet per year, or less than a third of the existing water supply. For most communities in the basin the limiting factor is not the existing water supply, but the water system's capacity. Existing culinary water supplies and the individual system capacities are covered in detail in Section 11, "Drinking Water."

The basin's community water system customers use an average of 151 gallons per person per day (gpcd) for residential use. For Tooele County the residential use is 148 gpcd. Commercial indoor and outdoor use accounts for an additional 15 gpcd from community water systems in Tooele County and 16 gpcd for the basin. Institutional uses add 41 gpcd.

Table 5-6
Water Use for Public Community Systems
West Desert Basin
(acre-feet per year)

Source	Box Elder	Tooele	Juab	Millard	Total
Population Served	525	28,637	111	85	29,358
Potable Uses:					
Residential	178	4,750	12	25	4,965
Commercial	28	490	0	0	518
Institutional	8	1,320	1	8	1,337
Industrial/Stockwatering	20	240	0	0	260
Total Culinary	234	6,800	13	33	7,080
Non-Potable Use					
Residential	8	420	0	0	428
Commercial	0	0	0	0	0
Institutional	27	1,005	0	0	1,032
Industrial/Stockwatering	0	0	0	0	0
Total Secondary	35	1,425	0	0	1,460
Total Water Use	269	8,225	13	33	8,540

Source: Municipal and Industrial Water Supply and Uses in Columbia and Great Salt Lake Desert Basins, by Utah Division of Water Resources, July 1998.

Industrial use of community water system water is 7 gpcd for Tooele county and 8 gpcd for the entire basin. The total potable water use from community water systems is 211 gpcd for Tooele county and 216 gpcd for the basin. Residential and institutional use of non-potable water adds and additional 44 gpcd. This means the basin's average community water system customer uses 260 gpcd. For Tooele County the total per capita use is 255 gpcd. For a complete breakdown of per capita water use see Figure 9-1 and Figure 9-2.

The basin's total municipal and industrial water use for all categories is shown in Table 5-7 shows. Potable water use includes all Public Community Systems, Public Non-Community Systems, self-supplied industry and private domestic water use. At the present time the total potable water use in the basin is 22,020 acre-feet per year. Excluding the industrial use of salt water from the Great Salt Lake, the basin's total non- potable use is 23,480 acre-feet per year. Total M&I water use for the basin is 23,480 acre-feet per year.

5.4.2 Agricultural

Agricultural use is the largest single use of fresh water in the West Desert Basin. It is estimated that 181,700 (see Table 5-8) acre-feet of water is used to irrigate 78,770 acres. This is about 2.3 acre-feet per acre and an indication that there are significant water shortages in the basin. Typically throughout the basin the allocated water right is 4 acre-feet per acre.

Of the basin's irrigated lands, 27 percent (21,360 acres) are located in Tooele/Rush Valley. Another 21 percent (16,240 acres) are located in Curlew Valley, in the general vicinity of the town of Snowville. The remaining 52 percent are scattered around the basin. Of the 181,700 acre-feet per year of irrigation water, about 94,800 acre-feet per year is diverted from surface water sources with the remaining 86,900 acre-feet per year coming from pumped groundwater. The actual allocated water right for 78,770 acres would be 315,080 acre-feet of water, further illustrating the shortage of water in the basin.

5.4.3 Open Water, Wetland and Riparian Lands

There are only about 39,720 acres of mapped wetlands in the basin, and 24,610 acres of upland and lowland riparian lands. Together the basin's riparian and wetlands constitute 64,330 acres or less than one percent of the basin's area. Nearly half (17,992 acres) of the basin's mapped wetlands are located in the Fish Springs National Wildlife Refuge in Dugway. Another significant wetlands area exists in the vicinity of Salt Marsh Lake in Snake Creek Valley. Much of the remaining wetlands are located along the shoreline of the Great Salt Lake, although small patches of important wetland and riparian habitat can be found in many canyons throughout the basin. Although wetlands and riparian areas constitute a very small portion of the basin's total area, they support a large diversity of wildlife. It will be important to maintain the wetlands and riparian areas to insure the basin's continued abundant and diversified wildlife.

Table 5-7
Total Municipal and Industrial Water Use for all Categories
West Desert Basin
(acre-feet per year)

Source	Box Elder	Tooele	Juab	Millard	Total
Potable Use:					
Public Community Systems	234	6,800	13	33	7,080
Public Non-Community Systems	26	460	4	0	490
Self-Supplied Industries	700	13,060	0	0	13,760
Private Domestic	160	470	40	20	690
Total Culinary	1,120	20,790	57	53	22,020
Non-Potable Use:					
Secondary Irrigation Systems	35	1,422	0	0	1,457
Non-Community Systems	0	3	0	0	3
Private Domestic	0	0	0	0	0
Self-Supplied Industrial[1]	0	0	0	0	0
Total Secondary	35	1,425	0	0	1,460
Total Water Use	1,155	22,215	57	53	23,480

Source: Municipal and Industrial Water Supply and Uses in Columbia and Great Salt Lake Desert Basins, by Utah Division of Water Resources, March 1997.
1. Does not include 10,000 acre-feet of freshwater exported to Kennecott, or 243,700 acre-feet of saline water diverted from the Great Salt Lake water for mineral extraction. (See Table 18-1)

Table 5-8
Irrigation Water Use By County

County	Area (acres)	Diversions (acre-feet per year)
Box Elder	41,480	94,100
Tooele	27,760	58,000
Juab	2,800	6,000
Millard	6,730	23,600
Total	78,770	181,700

Contents

Section 6

West Desert Basin

Utah State Water Plan

MANAGEMENT

6.1 INTRODUCTION

This section describes the existing water management systems for irrigation, municipal, industrial and wildlife use. Management organizations are listed and general recommendations are made. Management for water quality, fisheries, conservation and groundwater use are covered in other sections of this report. Water supplies throughout the West Desert Basin are locally managed by cities, towns, and irrigation companies.

6.2 SETTING

As was true in most other areas of the state, water supplies in the early years of settlement were managed by bishops of the Church of Jesus Christ of Latter-day Saints. Later, irrigators organized irrigation companies to manage the water resources. Culinary water systems were established soon after settlement by communities to meet domestic needs. They now operate under guidelines established by federal regulations and state rules administered by the Division of Water Rights and the Division of Drinking Water.

Pruess Reservoir

In 1869 the Southern Pacific Railroad constructed Rosebud Reservoir south of Park Valley. This was the first of twenty-four reservoirs constructed in the basin. Most of the basin's 24 reservoirs are used today to store water for irrigation, but there other uses including wildlife habitat, flood control and tailings storage. See Table 6-1 for a list of the basins reservoirs and Figure 6-1 for the locations.

> Management of the limited water supply's in the basin is necessary to ensure the proper diversion, transmission, treatment, storage and distribution of this valuable resource to the proper users.

6.3 MANAGEMENT ENTITIES AND SYSTEMS

6.3.1 Agricultural Water Management

Incorporated mutual irrigation companies serve the majority of irrigated land in the basin. Irrigation companies serving the West Desert Basin are identified in the Division of Water Right's publication, *Water Companies in Utah*. Only 30 of the companies listed have service areas exceeding 100 acres (Table 6-2). The acres served, as listed in Table 6-2, represent the acreage allowed by the water rights held by the companies and may not represent the actual acres irrigated. The 1994 water-related land-

Table 6-1
EXISTING RESERVOIRS
West Desert Basin

Dam Num.[1]	Name	County	Use	Stream	Owner	Surface Area (acres)	Total Storage (ac.-ft.)
012	Atherley	Tooele	Wildlife Habitat	Faust Creek	Utah Wildlife Resources	52	176
018	Bar B Ranch	Box Elder	Irrigation	Springs	Thiokol Corporation	15	82
044	Blue Creek	Box Elder	Irrigation	Blue Creek	Blue Creek Irr. Co.	135	2,185
083	Death Creek	Box Elder	Irrigation	Death Creek	Boyd Warr	21	228
084	Deep Creek (Tooele)	Tooele	Irrigation	Deep Creek Wash	Kraig Higginson	80	400
089	Dejarnatt	Box Elder	Flood Control	Blue Creek	Blue Creek Irr. Co.	66	385
123	Granite Creek	Juab	Irrigation	Red Cedar Creek	Red Cedar Corp.	76	186
139	Wrathal-Johnson	Tooele	Irrigation	Fishing Creek Springs	Paul Wrathal & Max Johnson	85	227
168	Pruess Lake	Millard	Irrigation	Lake Creek	LDS Church	300	11,803
201	Meadow Creek	Box Elder	Irrigation	Meadow Creek	J.R. Simplot	10	105
261	Rose Ranch	Box Elder	Irrigation	Deep Creek	Rose Ranch	165	300
270	Settlement Canyon	Tooele	Irrigation	Settlement Creek	Settlement Canyon Irr. Co	315	1,168
312	Vernon	Tooele	Irrigation	Vernon Creek	Vernon Irrigation Co.	35	560
319	Etna	Box Elder	Irrigation	West Fork Grouse Ck	WF Grouse Ck Irr. Co.	86	1,471
343	Grantsville	Tooele	Irrigation	S. & N. Willow Creeks	Grantsville Irrigation Co.	88	3,370
369	Warm Springs	Box Elder	Water Supply	Marble Canyon	John J Kunzler Estate	20	90
440	Mormon Gap	Millard	Water Supply	Antelope Valley	U.S. - B.L.M.	15	90
525	Rosebud	Box Elder	Irrigation	Rosebud Springs	Southern Pacific Co.	4	18
532	Sandarosa	Box Elder	Irrigation	Deep Creek	Signa Investment Inc.	175	3,750
538	State Line Creek	Iron	Irrigation	State Line Creek	Mike Flinspach	13	205
577	Grantsville Reg. Pond	Tooele	Regulating Reservoir	S. & N. Willow Creeks	Grantsville Irr. Co.	4	31

1. State Engineer’s identification number

Figure 6-1
EXISTING RESERVOIRS
West Desert Basin

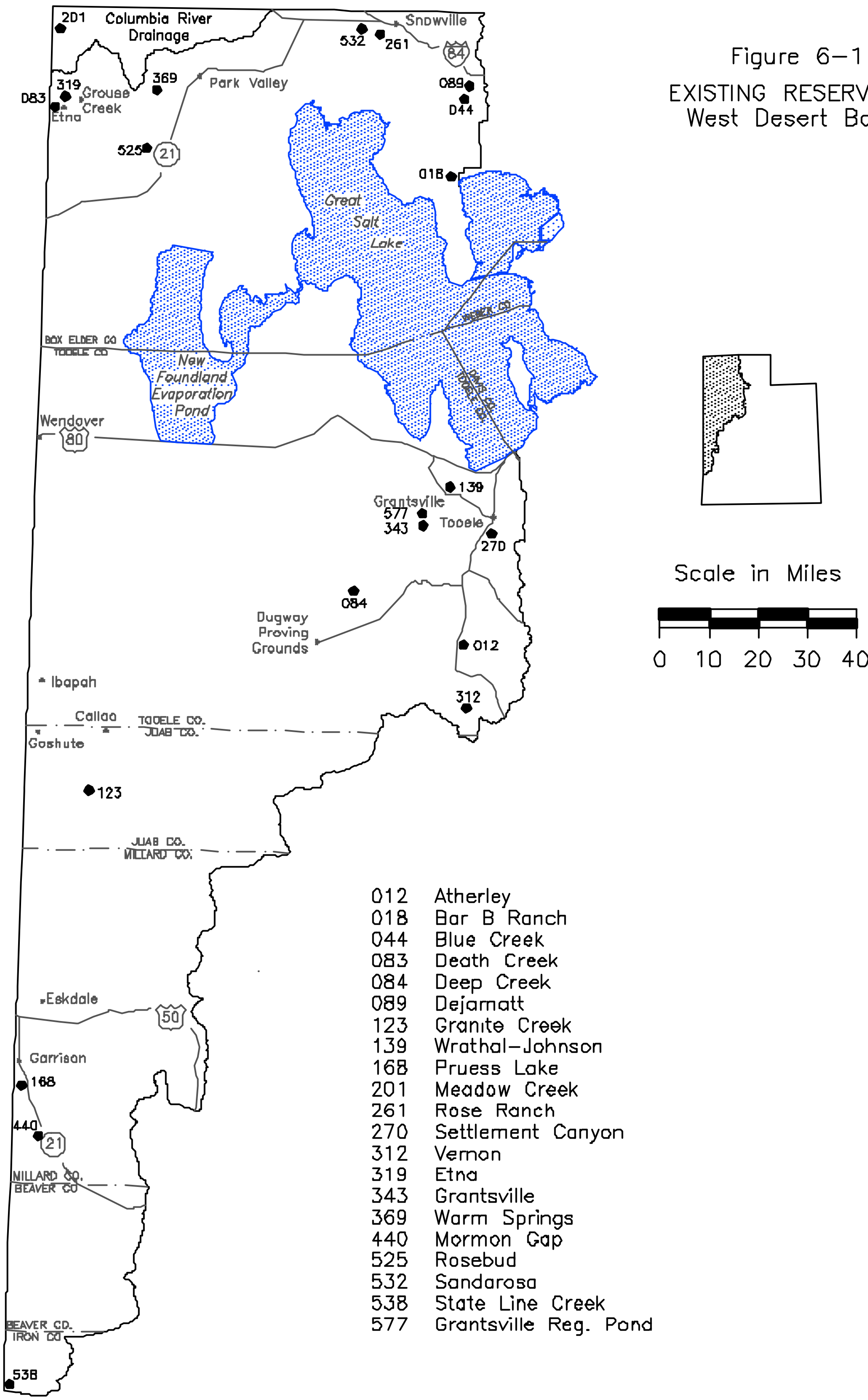


Table 6-2
IRRIGATION COMPANIES

Subbasin/Irrigation Company	Source	County	Irrigated Acres
Columbia River Basin			
George Creek Irrigation Corporation	George Creek & others	Box Elder	2,980
NAF Irrigation Company	Clear Creek	Box Elder	760
Rice and Jim Canyon Irrigation Company	Rice & Jim Canyon Cks	Box Elder	240
South Junction Creek Water Users	South Fork Raft River	Box Elder	890
Park Valley/Grouse Creek			
Curlew Irrigation Company	Grassy Flat Spring	Box Elder	2,600
Death Creek Irrigation Company	Death Creek	Box Elder	100
East Grouse Creek Water Company	Grouse Creek	Box Elder	1,000
Fisher Creek Irrigation Company	Fisher Creek	Box Elder	1,570
Marble Creek Irrigation Company	Marble Creek	Box Elder	3,000
Pine Creek Irrigation Company	Pine Canyon Creek	Box Elder	1,200
Rosen Valley Irrigation Company	Big Hollow Creek	Box Elder	760
Promontory			
Blue Creek Irrigation Company	Blue Creek Springs	Box Elder	1,070
Howell-Blue Creek Irrigation Company	Blue Creek	Box Elder	2,200
Great Salt Lake Desert			
West Deep Creek Irrigation and Power Co	West Deep Creek	Tooele	1,730
Callao Irrigation Company	Basin Creek & others	Juab	1,300
Tooele/Rush Valley			
E.T. Irrigation Canal Company	Mill Pond Spring	Tooele	610
Grantsville Irrigation Company	Davenport & S.Willow Creek	Tooele	4000
Harker Creek Irrigation Company	Harker Creek	Tooele	200
Hickman Creek Irrigation Company	Hickman Creek	Tooele	1000
Middle Canyon Irrigation Company	Middle Canyon	Tooele	510
Ophir Creek Water Company	Ophir Creek	Tooele	1090
Settlement Canyon Irrigation Company	Settlement Canyon Ck	Tooele	580
Soldier Canyon Water Company	Soldier Creek	Tooele	700
St John Irrigation Company	Clover Creek	Tooele	150
Upper Clover Irrigation Company	Clover Creek	Tooele	850
Vernon Irrigation Company	Vernon Creek and others	Tooele	1000

This list only includes companies with water rights to serve lands in excess of 100 acres.

use survey of the basin identified 78,770 acres of irrigated lands. The current agricultural land use trends are discussed in greater detail in Section 10.

6.3.2 Municipal and Industrial Water Systems

If a drinking water system serves at least 15 connections, or 25 people at least 60 days per year, it is generally defined by law as a "public water system." By this definition, there are 17 public water systems in the basin. A list of public water suppliers can be found in Table 11-1. Drinking water issues, including a more detailed analysis of the existing public drinking water systems within the basin are included in Section 11, “Drinking Water.”

Some light industries use water delivered by public water systems. It is estimated about 6 percent of the public water supply is used for industrial purposes. Most of the industrial water use, however, is self-supplied from privately held water rights, primarily wells. The biggest use of water for industrial purposes in the basin is mineral extraction from the Great Salt Lake. Several large companies operate evaporation ponds that extract salt and other valuable minerals from the Great Salt Lake. Subsequent mineral refinement processes frequently require a fresh water supply. See Section 18 for more detailed information on industrial water use.

6.3.3 Great Salt Lake Management

The Great Salt Lake watershed is home to more than 1.5 million inhabitants. With that many people present, toxic pollutants inevitably find their way into the lake. Storm runoff carries with it motor oil, gasoline, anti-freeze and other toxic materials from roads, parking lots, gas stations, home driveways and other locations. Often these non-point source pollutants are a much bigger problem than point sources. Point sources such as wastewater treatment plants are often targeted because they are easy to identify and monitor. Relative to many non-point sources, however, wastewater effluent is relatively free of toxic pollutants and provides the lake with beneficial nutrients. In contrast storm runoff can deliver significant amounts of toxic waste materials to the lake.

The Great Salt Lake provides hundreds of jobs and brings millions of dollars into the Utah economy through the mineral extraction and brine shrimp industries. At the same time, the Great Salt Lake provides a unique environmental habitat for many millions of migratory birds as well as many thousands of resident birds and other wildlife that inhabit the 250,000 acres of wetlands along the lake shoreline. The competing interests of wildlife and industry make management of the lake a complicated issue. On March 1, 2000 the Utah Department of Natural Resources published the Great Salt Lake Comprehensive Management Plan and Decision Document. This document was developed cooperatively with many state agencies and establishes the guidelines for the future management of the Great Salt Lake.

Between 1983 and 1987, the Great Salt Lake, in response to record rainfalls and unseasonable cool and wet springs, rose dramatically to a historic record high elevation of about 4212 feet above sea level. The high water flooded wastewater treatment facilities, power lines, dikes and wetlands at the wildlife refuges, and private duck clubs, as well as dikes and evaporating ponds at many commercial mineral extraction facilities along the lake’s shoreline. The high water also threatened freeways, railway lines, additional wastewater treatment facilities, and power lines, and caused further damage to the already impacted mineral mining companies and wildlife facilities around the lake.

In an effort to reduce the flooding around the lake, the state breached the railroad causeway on August 1, 1984. It had been determined that breaching the causeway would lower the south part of the lake at least one foot. By this time, the lake was so high that breaching was viewed as an interim measure until a more permanent solution could be found. Between 1984 and

1986 many alternatives were investigated in order to determine the best way to address the continued rise of the Great Salt Lake. In May, the Second Special Session of the 1986 Utah State Legislature authorized $60 million for the Utah Division of Water Resources to construct the West Desert Pumping Project. The pumps were built on the western shore of the lake at Hogup, delivering water to the diked New Foundland Evaporation Pond in the west desert, covering 320,000 acres. Great Salt Lake water was pumped into the west desert from May of 1987 through June of 1989. During that period of time the project lowered the lake approximately 26 inches. Today the pumps remain in place as insurance to reduce the impact of flooding should the Great Salt Lake again rise to elevations similar to those of the mid '80s.

West Desert Pump Station

The Utah Department of Natural Resources (DNR) and the Utah Division of Forestry, Fire and State Lands (DFFSL) are currently sponsoring the Great Salt Lake Planning Project to develop a coordinated natural resources management plan for the lands and resources of the Great Salt Lake. Primary management responsibility of the lake's resources lies with DFFSL pursuant to Title 65L of the Utah Code, which governs management of all state lands. Specifically, Section 65A-10-8, "Great Salt Lake - Management Responsibilities of the Division," require the division to:

"Prepare and maintain a comprehensive plan for the lake which recognizes the following policies: (a) develop strategies to deal with a fluctuating lake level; (b) encourage development of the lake in a manner which will preserve the lake, and protect recreation facilities; (c) maintain the lake's flood plain as a hazard zone; (d) promote water quality management for the lake and its tributary systems; (e) promote the development of lake brines, minerals, chemicals, and petro-chemicals to aid the state's economy; (f) encourage the use of appropriate areas for the extraction of brines, minerals, chemicals, petro-chemicals; (g) maintain the lake and the marches as important to the waterfowl flyway system; (h) encourage the development of an integrated industrial complex; (I) promote and maintain recreation areas on and surrounding the lake; (j) encourage safe boating use of the lake; (k) maintain and protect state, federal, and private marshlands, rookeries, and wildlife refuges; (l) provide public access to the lake for recreation, hunting and fishing."

The goal of the plan is to provide needed information and guidance in the form of recommendations to federal, state and local governments, and recommend legislation to the state legislature to facilitate and enhance management of the Great Salt Lake and its environs to assure protection of the unique ecosystem of the lake while promoting balanced multiple-resource uses. The objectives of the Great Salt Lake Planning Project are:

(1) To establish unifying DNR management objectives and policies for GSL trust resources,

(2) To coordinate the management, planning and research activities of DNR divisions on GSL,

(3) To coordinate management with the actions of land and resources owners and managers on and adjacent to the Great Salt Lake;

(4) To develop a sovereign lands and resources management plan, and

(5) To establish processes for plan

implementation, monitoring, evaluation and amendment.

6.3.4 Wetlands Management

Nearly half of the basin's mapped wetlands (17,992 acres) are located in the Fish Springs National Wildlife Refuge in Dugway, Utah. This valuable wildlife resource is managed by the U.S. Fish and Wildlife Service. It is a true oasis for wildlife in the midst of the Great Salt Lake Desert, providing a lush habitat for migrating and native species of birds. It is also home to many native mammals common to the Great Basin. There are an estimated 250,000 acres of wetlands along the southern and eastern shores of the Great Salt Lake. These wetlands are discussed in the Jordan River, Weber River and Bear River basin plans.

6.3.5 Watershed Management

The best way to reduce accelerated erosion is to establish a healthy watershed. If there is a variety of grasses and forbes along with brush in the lower elevations and a mixture of conifers and aspen along with grasses in the higher elevations, erosion will be drastically reduced. This will require an intensive rehabilitation program along with intensive management of livestock and wildlife grazing. With reduced erosion, there will be less sedimentation.

Along this same line, recent studies have indicated increases in runoff can be achieved if upper watershed vegetation can be managed. However, this will require more research. Studies to date indicate water yield can be increased if aspen dominated stands exist rather than mixed conifer with some aspen. For every 1,000 acres of forest lands converted from conifer to aspen, annual water gain of 250-500 acre-feet. In addition, there is a potential gain of 500 to 1,000 pounds of undergrowth, most of which is forage. This could lead to a gain in numbers and kinds of plants and animals.

Not only does this increase the downstream water supply and forage for livestock and wildlife, it also provides sites for recreational opportunities, wood fiber, landscape diversity and aesthetics. The loss of these benefits has come from the successional process, reduction of wildfire which has allowed dense conifer stands, and long-term overuse by cattle and wildlife. There are several, although often controversial, alternatives to reduce replacement of aspen stands by conifers, sagebrush or tall shrubs. These include fire, harvesting, spraying ripping and chaining.

6.4 MANAGEMENT PROBLEMS AND NEEDS

A problem throughout the basin is the lack of late season irrigation water. Throughout the basin surface water sources have been close to fully developed as agricultural water supplies. Most of the basins streams though are intermittent and convey little or no flow in the late summer and early fall. Agricultural communities that have developed secondary groundwater sources have a decided advantage over communities that have not.

6.5 ALTERNATIVES FOR MANAGEMENT IMPROVEMENTS

Providing for late season irrigation needs can be accomplished either by constructing reservoirs to capture spring runoff that exceeds the irrigation demand, or by additional groundwater development. The development of supplemental groundwater seems to be the most likely option since reservoir construction is very expensive when compared with the yield available for most West Desert Basin streams.

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Section 7

West Desert Basin

REGULATION/INSTITUTIONAL CONSIDERATIONS

7.1 INTRODUCTION

This section discusses the agencies responsible for water regulation in the West Desert Basin. This includes consideration of water rights, water quality and environmental concerns.

There are three state agencies primarily responsible for the regulation of water in the West Desert Basin. The Division of Water Rights, under the direction of the State Engineer, regulates water allocation and distribution according to state water law. Water quality is regulated at the state level by the Department of Environmental Quality through two agencies, the Division of Water Quality and the Division of Drinking Water. These agencies operate in accordance with the Utah Water Quality Act and the Utah Safe Drinking Water Act. Water quality is also regulated by various provisions of federal legislation.

7.2 SETTING

Water regulation is generally carried out under the direction of the aforementioned state agencies, although some federal agencies become involved when water issues are included in their mandates. Local, public and private institutions and entities usually manage and operate water systems at the local level.

Early water rights were controlled through the hierarchy of the LDS church. As secular governmental structures emerged, control of water rights was shifted to city and territorial governments. Disputes concerning water rights were resolved by county water commissioners and, after statehood in 1896, by the Division of Water Rights.

Regulatory systems are all ready in place to manage any conflicts and to provide for orderly future planning and development of the basins water resources.

7.2.1 Governmental Regulations

There is extensive regulation of the water resources throughout the West Desert Basin. Water masters and ditch riders operate the systems within each irrigation company. Cities and towns operate the community systems. Various types of entities administer and manage water delivery.

<u>Local Entities</u> - The Health Department and the Southwest Utah Board of Health are involved at the local level in health-related water matters. They carry out state regulations and local policy related to wells, their construction, and septic tanks and their effects on water quality.

<u>Department of Natural Resources</u> - This state agency is concerned with water resources and their relationship to the environment. The Division of Water Rights is responsible for water allocation, distribution, dam safety and stream channel alteration. The Division of Water Resources regulates the cloud seeding program and is responsible for state water resources planning and development. The Division of

Wildlife Resources is responsible for water related wildlife habitat and aesthetics and the water-based recreational activities. See sections 9,14 and 15, respectively.

Department of Environmental Quality - This state agency has primary responsibility for water quality. The Division of Drinking Water Quality ensures everyone has a high quality, dependable source of culinary water. The Division of Water Quality regulates the quality of streams, lakes and groundwater. The activities of these two agencies are discussed in Section 11, Drinking Water and Section 12, Water Quality.

Federal - Federal agencies also have responsibilities for water quality and environmental concerns. The Environmental Protection Agency has federal responsibility for water quality through the federal Clean Water Act and the Safe Drinking Water Act, although the state of Utah has primacy for carrying out these regulations. The Fish and Wildlife Service has a role in protecting water-related environments. Particularly where they affect endangered fish, waterfowl and plants. There are many types of organizations involved in water delivery to irrigated cropland. In addition to the mutual irrigation companies there are ditch systems, water user groups and private systems. In general, ditch systems have several owners, large water user groups and private systems consisting of only one or two water rights owners.

7.2.2 Existing Local Institutions and Organizations

Local organizations generally carry out the distribution of water in accordance with existing water rights and in compliance with the rules and regulations administered by the State Engineer. These local institutions, entities and organizations have also completed most of the water development. Distribution systems along with local entities formed under specific enabling legislation are described below.

Water Conservancy Districts - These are created under Title 17A-2-1401 of the *Utah Code Annotated.* They are established by District Court in response to a formal petition and are governed by a Board of Directors. The local county commission appoints the Board of Directors when the district consists of a single county. The governor appoints the Board of Directors when two or more counties are involved. Water conservancy districts have very broad powers. They include constructing and operating water systems, levying taxes and contracting with government entities. These districts include incorporated and unincorporated areas. There are three districts in the basin: the Bear River Water Conservancy District, the Millard County Water Conservancy District and the Rush Valley Water Conservancy District.

Mutual Irrigation Companies - These are the most common water development and management entities in the basin. They may be either profit or nonprofit, and they are formed under the State of Utah Corporation Code. In general, stockholders are granted the right to a quantity of water proportional to the number of shares they hold and assessments are levied similarly. In the West Desert Basin there are 36 Mutual Irrigation Companies. There are 26 irrigation companies with more than 100 acres of service area. These are listed in Table 6-2.

Water Companies - These are entities, such as special service districts, formed to provide water to subscribers. Private water companies operated for profit are regulated by the Division of Public Utilities. There are six water companies in the basin. They are: Erda Acres Company, Golden Gardens Water Company, Ophir Canyon Water Association, S & W Trailer Park Water Company, Silver Spurs Water Company and the Stansbury Park Improvement District. These are included in Table 11-1 alone with the Municipal Water Utilities.

City Water Utilities - These are utilities operated by incorporated cities and towns to provide water to residents and subscribers. Municipalities can form corporations to deliver water inside all or any part of a city boundary. Counties have the same authority in unincorporated areas. The Utah Code Annotated and local ordinances provide the legal framework for water system operation. Local entities may pass ordinances regulating water use. There are 11 City Water Utilities. They are listed in Table 11-1 along with the private water companies.

Other - Other water management related organizations include special improvement districts and watershed management districts. Within the basin there are two: Lakepoint Improvement District and Hansel Valley Watershed District.

7.3 WATER RIGHTS AND REGULATIONS

The State Engineer is responsible for determining whether there is unappropriated water and if additional applications will be granted. This is accomplished through data analysis and consideration of public input.

Before approving an application to appropriate water, the State Engineer must find: (1) there is unappropriated water in the proposed source; (2) the proposed use will not impair existing rights, (3) the proposed plan is physically and economically feasible; (4) the applicant has the financial ability to complete the proposed works; and (5) the applicant has filed in good faith and not for the purpose of speculation or monopoly. The State Engineer shall withhold action on or reject an application if he determines it will interfere with existing prior rights or prove detrimental to the public welfare, public recreation or the natural stream environment.

Utah water law allows changes in the point of diversion, place of use, and/or nature of use of an existing right. To accomplish such a change, the water user must file a change application with the Division of Water Rights. The approval or rejection of a change application depends largely on whether or not the proposed change will impair other vested rights. However, compensation can be made, or conflicting rights may be acquired. Approved applications and stock in mutual water companies are considered personal property. As such they can be bought and sold in the open market.

In the appropriation process, the State Engineer analyzes the available data and in most cases, conducts a public meeting to present findings and receive input before adopting a final policy regarding future appropriation and administration of water within an area. Through regulatory authority, the State Engineer influences water management by establishing diversion limitations or *duty of water* for various uses and by setting policies on water administration for surface water and groundwater supplies. The duty of water includes an allowance for reasonable distribution system and irrigation system inefficiencies.

The Division of Water Rights is responsible for a number of functions which include: (1) distribution of water in accordance with established water rights; (2) adjudication of water rights under an order of a state district court; (3) approval of plans and specifications for the construction of dams and inspection of existing structures for safety; (4) licensing and regulating the activities of water well drillers; (5) regulation of geothermal development; (6) authority to control streamflow, and reservoir storage, or releases during a flooding emergency; and (7) regulation of stream channel alteration activities.

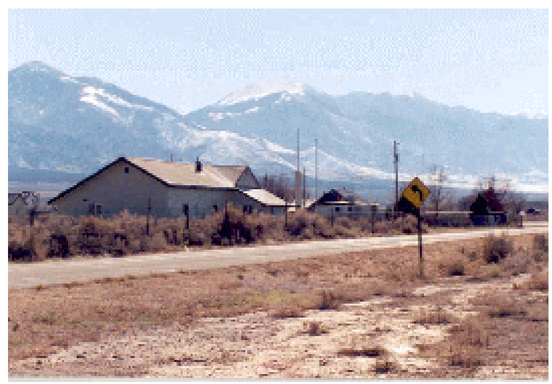
Water rights, and even approved applications, can be sold or purchased much like any other property right. The dollar value or worth of individual water rights varies greatly for the following reasons: (1) reliability of the water source; (2) priority of the water right; (3) water quality; (4) availability of other water sources; and (5) the existing demand. Although it is true that water rights have significant value, they may be lost if left unused for a sufficiently long period of time. Privately held water rights can be lost by five consecutive years of non-use.

In areas where surface and groundwater are considered to be fully appropriated, the potential for new water rights appropriations is very limited. Applications which have been previously approved may be developed and perfected.

7.3.1 Current Regulations

Under Utah water law, the distribution and use of water is based on the doctrine of prior appropriation. The Division of Water Rights is charged with the regulation and administration of water rights. To facilitate the administration and management of water rights, the state has been divided into Water Rights Management Areas (see Figure 7-1). For each of the areas, a regional engineer is assigned to oversee and manage the day-to-day activities. The Columbia River Drainage is designated as Area 11. The remainder of Box Elder County within the basin is designated as Area 13. These two water rights areas are managed out of the State Engineer's Northern Regional Office in Logan. Tooele and Rush Valleys constitute Area 15, the Great Salt Lake Desert is Area 16, the Ibapah and Goshute area west of the Deep Creek Mountains is designated as Area 17, and the northern and central portions of Snake Valley comprise Area 18. These areas are managed out of the Weber River Regional Office in Salt Lake. Pine Valley is designated as Area 14 and Hamlin Valley is Area 19. These areas are managed out of the State Engineer's Southwest Regional Office in Cedar City.

On April 24, 1956, the First District Court of Box Elder County ordered the State Engineer "to make a determination and adjudication of all rights to the use of water in the Columbia River Basin" with priority given to George Creek drainage. A book of proposed determinations for the George Creek area was published on December 1, 1959. The proposed determination for the remainder of the Columbia River Drainage (Goose Creek, Raft River, and Clear Creek) was published on August 1, 1965. A court order to adjudicate the Tooele and Rush Valleys was made on June 2, 1956. The proposed determination for the Rush Valley area was published on August 10, 1973. The Tooele Valley area was apportioned into three divisions. A book of proposed determinations for the Grantsville Division was published on November 1, 1985. A book of proposed determinations for the Erda/Lakepoint Division was published on December 2, 1989. A book of proposed determinations for the Tooele Division has not yet been published.



Goshute Valley & Deep Creek Mountains

Although there are specific areas within the basin currently closed to new water rights applications, much of the West Desert Basin remains open to new applications. The general status of water right applications and water right policy within West Desert Basin is summarized in Table 7-1.

7.4 WATER QUALITY CONTROL

The discharge of pollutants is regulated under the Utah Water Quality Act (UWQA) found in *Utah Code Annotated, Title 26, Chapter 11.* The Utah Water Quality Board (UWQB) has developed rules, regulations, policies and continuing planning processes necessary to

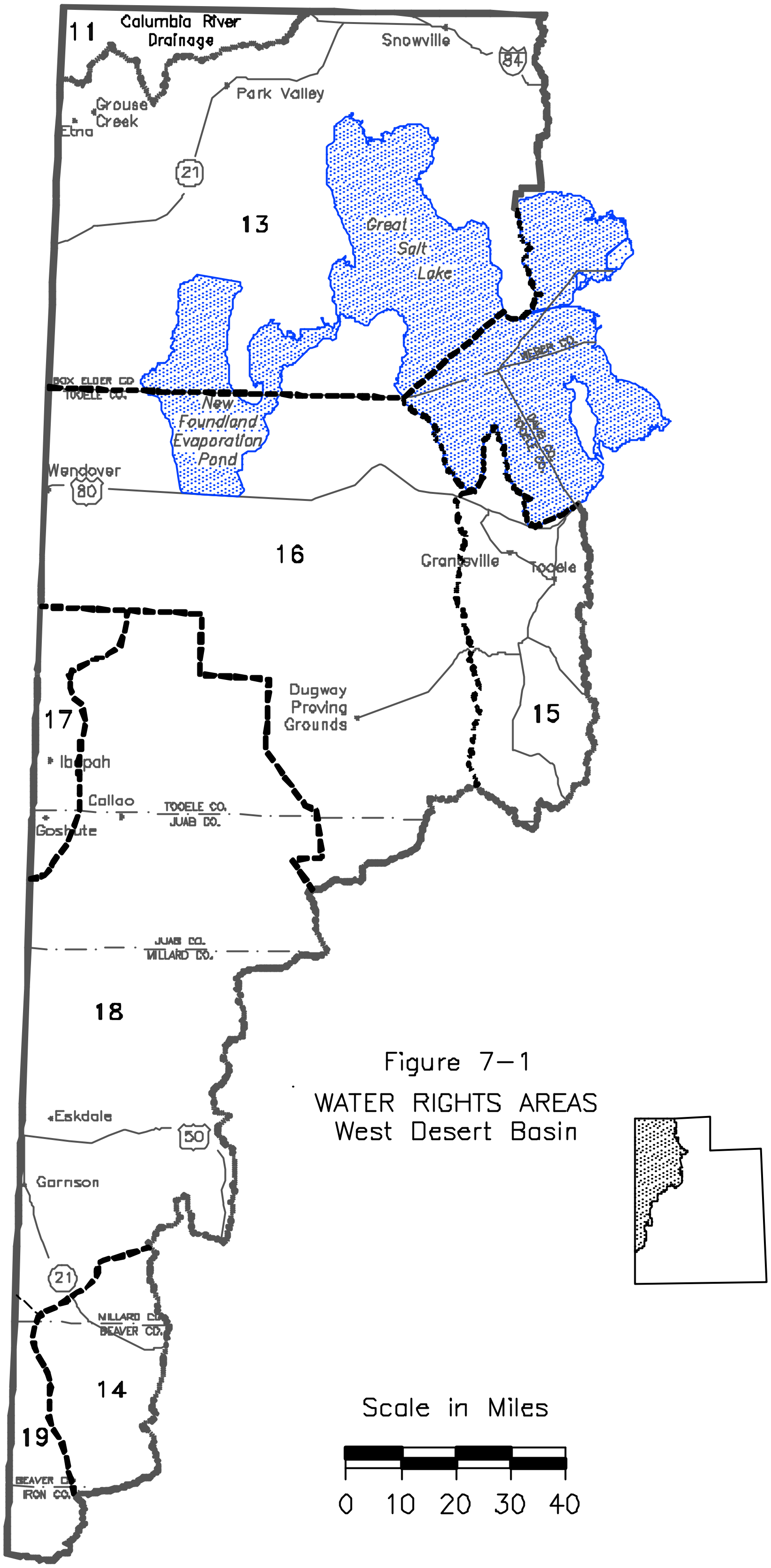


Figure 7–1
WATER RIGHTS AREAS
West Desert Basin

Table 7-1 **GENERAL STATUS OF WATER RIGHTS** West Desert Basin		
AREA	SUBAREA	STATUS AND GENERAL POLICY
11	George Creek & Johnson Creek	Status: Proposed Determination published in December 1, 1959. Policy: Both Surface and Groundwater appropriations are open.
	Goose Creek, Raft River & Clear Creek	Status: Proposed Determination published in August 1, 1965. Policy: Both Surface and Groundwater appropriations are open.
13	Grouse Creek	Status: Proposed Determination published in January 1, 1966. Policy: Both Surface and Groundwater appropriations are open.
	Park Valley	Status: Proposed Determination published in April 1, 1968. Policy: Both Surface and Groundwater appropriations are open.
	Snowville/Promontory	Status: Proposed Determination published in April 1, 1969. Policy: Much of area closed to new applications. A few exceptions for domestic and stock watering
	Southwestern Box Elder	Status: Proposed Determination published in May 1, 1970. Policy: Both Surface and Groundwater appropriations are open.
15	Rush Valley	Status: Proposed Determination published in August 10, 1973. Policy: Both Surface and Groundwater appropriations are open.
	Grantsville Division	Status: Proposed Determination published in November 1, 1985. Policy: Closed to both Surface and Groundwater applications.
	Erda/Lakepoint	Status: Proposed Determination published in December 22, 1989. Policy: Closed to both Surface and Groundwater applications.
	Tooele	Status: Not Adjudicated. Policy: Closed to both Surface and Groundwater applications.
16	Great Salt Lake Desert	Status: Not Adjudicated. Policy: Both Surface and Groundwater appropriations are open.
17	Ibapah/Goshute	Status: Not Adjudicated. Policy: Both Surface and Groundwater appropriations are open.
18	Snake Valley	Status: Not Adjudicated. Policy: Both Surface and Groundwater appropriations are open.
14	Pine Valley	Status: Not Adjudicated. Policy: Both Surface and Groundwater appropriations are open.
19	Hamlin Valley	Status: Proposed Determination published on October, 1 1969. Policy: Both Surface and Groundwater appropriations are open.

prevent, control and abate new or existing pollution, of surface water and groundwater. These are carried out by the Division of Water Quality. They are described in Section 7 of the State Water Plan.

Water quality certification by the state is covered under Section 401 of the federal Water Pollution Control Act, 1977. This act requires state certification on any application for a federal license or permit resulting in discharge into waters, and/or wetlands of the United States. These activities include, but are not limited to, the construction or operation of the discharging facilities. Any discharges shall comply with applicable state water quality standards and the applicable provisions of the Clean Water Act (CWA). In addition, the UWQA adopts and enforces "Ground Water Protection Rules." These rules are building blocks in a formal program to protect beneficial uses of groundwater in Utah.

Three main regulatory philosophies are emphasized. They are: (1) Deterioration of groundwater quality shall be prohibited; (2) prevention of groundwater contamination is preferable to after-the-fact pollution remediation, and (3) provide protection based on the differences in existing groundwater quality. There are five significant components: (1) Groundwater quality standards, (2) groundwater classification, (3) groundwater protection levels, (4) aquifer classification procedures, and (5) a groundwater discharge permit system. Statutory authority for the regulations is contained in Chapter 19-5 of the Utah Code Annotated.

The groundwater permitting system controls activities affecting groundwater quality. A permit will be required if, under normal circumstances, there may be a release to groundwater. Owners of existing facilities will not be obligated to apply for a groundwater discharge permit immediately if they were in operation, or under construction, before February 10, 1990. Owners of such facilities are required to notify the Executive Secretary of the UWQB of the nature and location of their discharge.

These regulations provide for a "permit by rule" for certain facilities or activities. Many operations pose little or no threat to groundwater quality. Some are already adequately regulated by other agencies. These are automatically extended a permit. Therefore, facilities qualifying under provisions of the Utah Administrative Rules, Section R317-6-6.2, will administratively be extended a groundwater discharge permit (permit by rule). However, these operations are not exempt from the applicable class limits on parameters such as total dissolved solids nor groundwater quality standards.

The authority for Clean Water Act, Section 401 certification, commonly known as 401 Water Quality Certification, is carried out through the UWQB by the Division of Water Quality. Whether the Environmental Protection Agency (EPA) administers a CWA program directly or delegates it to a state (i.e. primacy delegation), EPA retains an oversight role to insure compliance with all regulations, rules and policies.

Local communities are encouraged to set up and carry out a "Local Aquifer Protection Management Plan." Contact the Division of Water Quality for information.

7.5 DRINKING WATER REGULATIONS

The Drinking Water Board is responsible for setting and enforcing standards to assure a safe water supply for domestic culinary uses. It regulates any system defined as a public water system. This may be publicly or privately owned. The Drinking Water Board has adopted State of Utah Administrative Rules for Public Drinking Water Systems to help assure safe drinking water. The Drinking Water Board is empowered to adopt and enforce rules establishing standards prescribing maximum contaminant levels in public water systems. This authority is given by Title 26, Chapter 12, Section 5 of the *Utah Code Annotated, 1953*. The rules on drinking water standards have been, and continue to be, adopted after public hearings. These standards govern bacteriologic quality, inorganic chemical quality, radiologic quality, organic quality and turbidity. The rules also prescribe monitoring frequency and sampling procedures.

The State of Utah Administrative rules for public drinking water systems must be in agreement with the federal Safe Drinking Water Act. This act sets federal drinking water standards and regulations. The 1996 Re-authorized Safe Drinking Water Act established a revolving loan program to provide money to states to construct drinking water treatment plants and other safe drinking water improvements. It also relaxes some Environmental Protection Agency requirements for setting standards for drinking water and provides more flexibility for small and rural systems. A portion of the funds provided by the program will be used by states for regional water management planning in their respective states.

The Division of Drinking Water serves as staff for the Drinking Water Board to assure compliance with federal regulations and state rules. At the local level, considerable reliance is placed on public water system operators. Presently, only community water systems that serve over 800 people, or have treatment processes in place, must have a state-certified water operator. Effective in the year 2000, however, all community public water systems will require at least one such operator. Chapter 11 discusses in detail the distinction between community and non-community public water systems.

The Division of Drinking Water also administers the Drinking Water Source Protection Program. This program is designed to protect wells and springs from surface contamination. Owners of wells and springs are required to develop protection programs based on the areas of influence around the source. The purpose of the program is to develop controls for potential sources of pollution to the groundwater. The Drinking Water Source Protection Program includes monitoring delivered drinking water quality for the detection of contamination, as well as monitoring land use activities around wells and springs for identification of pollution threats.

7.6 ENVIRONMENTAL CONSIDERATIONS

Water is an intricate part of our existence and influences many activities we are a part of each day throughout our lives. Water is most often recognized for its place in supporting our life but the other values are often ignored or placed in subordinate roles. An adequate quantity and quality of water is needed for maintenance of healthy wildlife populations and habitat. This includes providing instream flows where possible and maintaining wetland areas.

The legislature recognized the value of instream flows when it approved legislation allowing the Division of Wildlife Resources and the Division of Parks and Recreation to acquire water rights for this purpose. This authority has not been in general use in the basin as normal operation and use.

Wetlands are important features in the groundwater recharge and discharge cycles. They also provide flood storage, trap sediment, control pollution, provide food chain support and habitat for fish and wildlife, and recreation.

Grantsville Reservoir

There are two sources of pollution; geologic and man-caused. Geologic pollution is generally difficult to control. Man-caused pollution can adversely affect the surface water and the groundwater quality. Pollution sources include agriculture, onsite waste treatment systems, solid waste, mining, oil and gas exploration, and urban runoff. The West Desert Basin is primarily an agricultural area which may be a subject to pollution from pesticides and other chemicals used for insect and disease control.

7.7 DAM SAFETY

All dams in Utah which impound in excess of 20 acre-feet of water are assigned a hazard rating. Dams impounding less than 20 acre-feet may be ruled exempt by the state engineer if they do not pose a threat to human life or property. The hazard rating does not reflect the condition or reliability of the dam, but rather it reflects the potential for loss of life or occurrence of property damage in the event the dam were to fail. Hazard ratings are either high, moderate or low. The hazard rating is used to determine the frequency of inspections. High hazard dams are inspected yearly, moderate hazard dams every other year and low hazard dams every fifth year. Following the inspection, a letter from the State Engineer documents any maintenance needs and requests specific repairs. The State Engineer is empowered to declare a dam unsafe and order it breached and/or the impoundment drained. However, every effort is made to work with dam owners to schedule necessary remedial actions.

The Division of Water Rights maintains dam design standards, which are outlined in a publication entitled, *State of Utah Statutes and Administrative Rules for Dam Safety*. Plans and specifications for new construction and repair work must be consistent with these standards. Dam safety personnel monitor construction to insure compliance with plans, specifications and design reports. Any problems are resolved before final approval is given.

Table 7-2 gives the hazard rating for each of the West Desert Basin reservoirs. For information on dam owners and stream locations see, Table 6-1.

Through the year 2000, the State Engineer is assessing the ability of all high hazard dams to meet minimum safety requirements. The assessment includes seismic stability, and the ability of the dam to pass the probable maximum flood.

Table 7-2

HAZARD RATING OF EXISTING RESERVOIRS

West Desert Basin

Dam Number	Name	Built	Total Storage (acre-feet)	Hazard Rating
044	Blue Creek	1904 (modified 1986)	2,185	High
343	Grantsville	1984	3,370	High
270	Settlement Canyon	1966 (modified 1985)	1,168	High
089	Dejarnatt	1967	385	Mod
319	Etna	1959	1,471	Mod
577	Grantsville Reg. Pond	1986	31	Mod
168	Pruess Lake	1900	11,803	Mod
312	Vernon	1973	560	Mod
012	Atherley	1928	176	Low
018	Bar B Ranch	1953	82	Low
083	Death Creek	1960	228	Low
084	Deep Creek (Tooele)	1981	400	Low
123	Granite Creek	1940	186	Low
201	Meadow Creek	1929	105	Low
440	Mormon Gap	1939	90	Low
525	Rosebud	1869	18	Low
261	Rose Ranch	1963	300	Low
532	Sandarosa	1982	3,750	Low
538	State Line Creek	1984 (modified 1992)	205	Low
369	Warm Springs	1880	90	Low
139	Wrathal-Johnson	1947	227	Low

Contents

Section 8

West Desert Basin

Utah State Water Plan

WATER FUNDING PROGRAMS

8.1 INTRODUCTION

This section briefly describes many of the state, federal and local funding programs available to plan and implement water resources projects in the West Desert Basin. Additional information can be found in the *State Water Plan* (1990), Section 3, "Introduction," and Section 8, "State and Federal Water Resource Funding Programs." More specific information regarding specific agency programs can also be found in other sections of the State Water Plan.

8.2 BACKGROUND

Over the years, citizens of Utah have spent millions of their own dollars to develop water resources. In Utah's early years, individuals, private irrigation companies and the Church of Jesus Christ of Latter-day Saints worked together to develop water facilities. Today, private citizens still play an important role in funding water development projects. The federal and state governments have developed numerous programs which make grants and low-interest loan money available for water development. Many of these funding programs require up-front cost-sharing from individuals, groups or entities receiving benefits from the projects or complete repayment of revolving loan funds.

There is a continuing need for water-related projects. In the past, significant funding assistance has been made available through federal programs. In today's political climate, limited federal funding is still available but is becoming more scarce and carries with it restrictive federal regulations and guidelines. There has been an increasing need for more local and state funding to offset the loss of federal assistance. More details on federal funding is included in Section 8 of the *State Water Plan (1990)* and in Section 16 of this document.

> Water development includes direct and indirect benefits, not only to the project owners and developers, but also to the surrounding communities and society as a whole. To derive the benefits of the water it takes money to develop this liquid asset. Fortunately there are various sources of funding for water development.

Since the turn of the century, some state funds have been available to construct water development projects. These were relatively minor amounts until 1947 when the state legislature created the Utah Water and Power Board and established the Revolving Construction Fund. Since then, state funding programs have been established under various boards, commissions and committees. Population expansion and cost increases have required project sponsors to seek additional funds from other sources. In the past, these state and federal programs have been used to fund projects in the West Desert Basin. The extent of this funding in recent years is shown in Tables 8-1 and 8-2.

Table 8-1
STATE FUNDING PROGRAMS

Entity/Program	Contact Agency	Purpose	Type
Board of Water Resources			
Revolving Construction Fund	Division of Water Resources	Small irrigation and culinary projects	Loans
Cities Water Loan Fund		Municipal culinary water systems	Loans
Conservation & Development Fund		Large water improvement projects	Loans
Dam Safety		Stabilize and repair dams	Loans & Grants
Community Impact Fund Board			
Permanent Community Impact Fund	Division of Community Development	Schools, roads, medical, & water Improvements	Grants & Loans
Disaster Relief Board Fund		County or municipal flood repair	Grants
Community Dev. Block Grants Policy Board			
Community Development Block Grants Program	Division of Community Development	Improved living environment for small communities and counties	Grants
Drinking Water Board			
Financial Construction Program	Division of Drinking Water	Drinking water facilities	Loans
Water Quality Board			
Federal Commission Grants	Division of Water Quality	Wastewater treatment facilities	Loans
Wastewater Treatment Facilities Financial Assistance Program		Wastewater treatment facilities	Grants
Utah Soil Conservation Commission			
Agricultural Resource Development Loans	Department of Agriculture	Improvements of cropland and non-federal rangeland & watershed improvements	Loans Grants
Board of Parks and Recreation			
Land & Water Conservation Fund	Division of Parks and Recreation	Swimming, boating, and other recreation-related facilities	50-50 Cost-Sharing Grants
Wildlife Board			
Wallup/Breaux Bill	Division of Wildlife Resources	Sport fishery management and boating access	Grants

Table 8-2

FEDERAL FUNDING PROGRAMS

Administering Agency	Program	Purpose	Type
Department of Agriculture Farm Service Agency	Agricultural Conservation Program	Soil, water, and energy conservation.	Grants
	Emergency Conservation Program	Rehabilitation of farmland damaged by wind, floods or other natural disasters.	Grants
	Conservation Reserve Program	Reduce erosion and maintain wetlands.	Grants
Rural Development	Rural Development	Water supply and wastewater disposal.	Grants & Loans
	Resource Conservation & Development	Multiple purpose water & related-land conservation andother facilities.	Loans
Natural Resources Conservation Service	Watershed Protection & Flood Prevent.	Flood control, and water development	Grants
	Environment Quality Incentives Program	Environmental quality improvement	Grants
	Resource Conservation & Development	Multiple purpose water & related-land conservation	Grants
	Emergency Watershed Program	Natural Disasters	Grants
Department of the Army Corps of Engineers	Civil Works	Flood control, water supply & recreation	Cost Sharing
	Ecosystem Restoration	All environmentally related projects	Cost Sharing
	Flood Plain Management Services	Flood plain delineation	Grants
	Continuing Authorities Program	Flood protection.	Cost Sharing
	Emergency Activities	Flood protection.	Cost Sharing
Department of the Interior Bureau of Reclamation	Investigations Program	Water storage/delivery & related purposes.	Loans
	Loan Programs	Small multiple-purpose water developments.	Loans
Department of Housing and Urban Development	Community Development Block Grant Program	Water resources planning & development.	Grants
Federal Emergency Management Agency	Presidential Declared Disaster	Flood damage mitigation.	Grants
	Flood Plain Management	Acquisition of structures in flood plains.	Grants
Environmental Protection Agency	Nonpoint Source Program	Water Quality	Grants

8.3 STATE WATER FUNDING PROGRAMS

There are eight state entities with funding programs (see Table 8-1) available to assist local communities for various community development projects. These funding programs include both loan and grant monies. Although not all of these funding programs were created specifically for water development, each can, and have been applied to water-related development projects. Though these programs are generally targeted for diverse purposes, there are cases where more than one program can assist with a particular project. These state funding programs are briefly described in Table 8-3.

Drinking Water Board: Through the 1996 reauthorized Safe Drinking Water Act, the Drinking Water Board is receiving funding to establish a Drinking Water State Revolving Fund (SRF). The purpose of the fund is to ensure all drinking water systems within the state are capable of maintaining and protecting the supply of safe drinking water at an affordable cost. The Drinking Water Board expects to receive grants, a portion of which will go into the SRF for project constructions. The amounts for project construction are: $9.76 million in 1998, $6.0 million in 1999, $6.5 million in 2000, and between $6.0 and $6.5 million every year through 2003, available for project funding. The state is expected to provide an additional 20 percent of each appropriation as matching cost-share funds. In addition to the project funds, the Drinking Water Board has a portion of its federal appropriations available for regional water system planning.

8.4 FEDERAL WATER FUNDING PROGRAMS

Federal water-related grant and loan programs exist within various agencies in the Departments of Agriculture, Army, Interior and the Environmental Protection Agency. Funding for these programs has fluctuated but with a general decline in recent years.

General funding programs are still a viable source of financial assistance. However, environmental protection rather than water development is typically the focus of these programs. These programs are briefly described in Table 8-4.

Table 8-3

STATE WATER-RELATED FUNDING EXPENDITURES

($1000)

	Box Elder County		Tooele County		Juab County		Millard County		Beaver County		Davis County‡		Total Project	Time Period
	Grants	Loans	Grants	Loans	Grants	Loans	Grants	Loans	Grants	Loans	Grants	Loans		
Board of Water Resources														
Revolving Construction Fund	-	1,440	-	2,331	-	26	-	48	-	0	-	0	6,230	1948-1997
Cities Water Loan Fund	-	60	-	433	-	0	-	0	-	0	-	0	1,804	1976-1982
Conservation & Development Fund	-	0	-	8,880	-	0	-	0	-	0	-	0	9,168	1983-1996
Dam Safety	-	0	-	0	-	0	-	0	-	0	-	0	0	-
Community Impact Fund Board														
Permanent Community Impact Fund	0	-	0	-	0	-	0	-	0	-	0	-	-	-
Community Dev. Block Grants Policy Board														
Community Development Block Grants Program	396*	-	1,371	-	0	-	0	-	0	-	0	-	-	1992-1996
Drinking Water Board														
Financial Assistance Program	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Water Quality Board														
EPA 314 Clean Lakes Program	-	0	-	0	-	0	-	0	-	0	-	0	0	-
Federal Construction Grants	-	0	-	0	-	0	-	0	-	0	-	0	0	-
Wastewater Treatment Facilities Financial Assistance Program	-	0	-	11,298	-	0	-	0	-	0	-	0	11,298	
Utah Soil Conservation Commission														
Agricultural Resource Development Loans	-	179	-	203	-	373	-	0	-	0	-	0	-	1993-1998
Board of Parks and Recreation														
Land & Water Conservation Fund	46	-	136	-	-	-	-	-	6	-	2,400	-	5,277	
River Enhancement Grant Program	-	-	25	-	-	-	-	-	-	-	-	-	-	
OHV Motorized Trail Matching Grant Projects	-	-	25	-	-	-	-	-	-	-	-	-	-	
Wildlife Board														
Wallup/Breaux Bill	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Totals	442	1679	1557	23,145	0	399	0	48	6	0	2,400	0	33,777	

* Includes all of Box Elder County ‡ Antelope Island is in Davis County

Table 8-4
FEDERAL WATER-RELATED FUNDING EXPENDITURES

Funding Agency Program	Box Elder County		Tooele County		Juab County		Millard County		Beaver County		Period
	Grants	Loans	Grants	Loans	Grants	Loans	Grants	Loans	Grants	Loans	
Department of Agriculture											1950-1998
Farm Service Agency	60,000	0	21,000	0	10,000	0	15,000	0	0	0	
Rural Development	0	0	0	0	0	0	0	0	0	0	
Natural Resources Conservation Service	1,062,000	0	221,000	0	0	0	0	0	0	0	
Department of the Army											
Corps of Engineers											
Civil Works	0	-	0	-	0	-	0	-	0	-	1997
Emergency Works	0	-	0	-	0	-	0	-	0	-	
Continuing Authority	20,000	-	20,000	-	0	-	0	-	0	-	
Department of the Interior											
Bureau of Reclamation	0	0	0	0	0	0	0	0	0	0	0
Federal Emergency Management Agency	327,490[a]	-	1,249,200	-	3,049,630[a]	0	1,317,130[a]	0	0	0	
Environmental Protection Agency[b]											
Total	1,469,490		1,511,200		3,059,630		1,332,130				

a:This is a countywide total
b: Funs are transmitted through the Department of Environmental Quality

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Section 9

West Desert Basin

Water Planning and Development

9.1 INTRODUCTION

This section describes existing and potential alternatives for meeting the future water needs in the West Desert Basin. Present water uses and supplies are discussed along with future water needs, and alternatives for meeting needs, environmental, financial and economic considerations, and water quality issues. Existing water supplies are essential to the local agricultural industry and the local communities. They also provide aesthetic and environmental values and provide recreational values for the local residents

The goal of the Division of Water Resources is to assist local entities and coordinate with other state and federal agencies in effective water-related activities. The decision-making process is still the responsibility of the local people. This plan provides local decision-makers with data and information to solve existing problems and to plan for future implementation of the most viable alternatives.

9.2 BACKGROUND

Water development was an essential element of early settlements. The availability of water resources was critical as the basin's first settlers realized successful settlement would occur only where water resources were available. Early Mormon church leaders stressed community development over individual ownership, especially with regards to natural resources. The early pioneers' approach was to develop cooperative water distribution systems. Those early ideals laid the foundation for many of the principles embodied in today's Utah Water Law, and the methods now employed to administer and manage the state's water resources. Community rights led to a standard of "beneficial use" as the basis for the establishment of an individual water right. The overriding principle of Utah's water law is that all water belongs to the citizens of the state. Throughout the years, water planning and development have been founded upon this principle.

> Water Planning is essential to ensure water management, development and conservation will meet all of the future needs within the basin.

Rustic old cabin in Tooele Valley

9.2.1 Past Water Planning and Development

Water development began with the first settlements of pioneers in the late 1840s. In 1847 and 1848, prior to any settlement, Tooele and Rush Valleys were used as a herd ground for cattle. In September of 1849, the first white settlers came into Tooele Valley and settled south of the present site of Tooele. Settlement in the Grantsville area started the following year. Over the course of the next few decades, settlements were established throughout the Tooele and Rush Valleys as well as other areas of the basin: Snowville, Park Valley, and Grouse Creek to the north, Callao to the south and later Wendover to the west. Except for Wendover, these communities were located in valleys where mountain streams could be developed for irrigation use. During the same period of time, wells were dug to provide culinary water for the settlements.

Since the turn of the century, a few small reservoirs have been constructed within the basin to facilitate the development of water resources (Table 6-1 lists existing reservoirs). Other past water development projects included the construction of canals, canal lining, culinary water systems, culinary water storage tanks and ponds, and wastewater treatment facilities.

Over the years, the Board of Water Resources has provided technical assistance and funding for 53 projects in the West Desert Basin totaling just over $13.2 million. These projects are listed in Table 9-1. For a breakdown of the loaned amounts by fund see Table 8-1

9.2.2 Current Water Planning and Development

Throughout the basin, current water planning and development means infrastructural improvements. As shown in Table 9-2, most of the basin's major water suppliers have adequate water supplies to take them through the year 2020. Three towns, Tooele, Vernon, and Goshute, have projected water shortages for 2020, but the shortages are not significant. Three more water providers, Erda Acres Water Company, Lincoln Culinary Water, and S & W Trailer Park have existing water supplies equal to their 2020 water demand. For each of these municipalities an adequate supply of water is available either through development of new sources or the purchase and transfer of existing rights. However, when existing system capacities are compared with the future demand (see Table 9-2), it is apparent that many of the basin's community water systems will be inadequate to meet the futures needs. Except for Dugway, Stockton and Wendover, all of the Tooele County community water systems have insufficient system capacity to meet the 2020 demand. The Goshute Indian Reservation also has inadequate system capacity to meet the 2020 demand. The community water systems in Box Elder County (Grouse Creek, Howell, and Snowville) and the Eskdale Community Water System in Millard County all have sufficient capacity for their 2020 demand.

The system capacities shown in Table 9-2 represents the volume of water, which when divided by the average annual water per capita use, gives the population that can be reliably served by the existing system under peak day demand conditions. The factors limiting delivery differ from system to system. For some communities, correcting the problem could be as simple as increasing well capacity. Other communities may need to increase storage capacity, and/or enlarge their delivery system. Each community needs to take a look at its own water systems and determine the best solution.

9.2.3 Environmental Considerations

Instream flows and water quality issues are as essential to good planning and development as any other issue, and should be considered early and often in the planning process. Although there are no established instream flow requirements within the West Desert Basin, there are established water rights for public bird and wildlife refuge areas.

9.3 WATER RESOURCE PROBLEMS

Throughout the West Desert Basin, the scarcity of water has generated a few water issues and problems for the local residents. The biggest water supply problem in the basin is the

Table 9-1
BOARD OF WATER RESOURCES DEVELOPMENT PROJECTS

Sponsor	Type	Year
Box Elder County		
Blue Creek Irrigation Company	Dam	1949
Blue Creek Irrigation Company	Dam-Enlargement	1967
Blue Creek Irrigation Company	Dam-Reparations	1986
Death Creek Irrigation Company	Dam-Reservoir	1960
East Grouse Creek Water Pipeline	Culinary System	1978
Fisher Creek Irrigation Company	Pipe	1952
Fisher Creek Irrigation Company	Sprinkler	1977
Grouse Creek Water Company	Well	1948
Howell Town	Culinary Pipe	1976
Irrigation Co. of the West Fork of Grouse Cr.	Dam-Reservoir	1959
Irrigation Co. of the West Fork of Grouse Cr.	Sprinkler	1973
Irrigation Co. of the West Fork of Grouse Cr.	Pipe	1997
Marble Creek Irrigation Company	Pipe	1948
Marble Creek Irrigation Company	Pipe	1961
Marble Creek Irrigation Company	Sprinkler	1977
Oren L Kimber Enterprises	Stockwater	1977
Gerald H Rose	Stockwater	1978
Snowville Waterworks Corporation	Culinary Tank	1984
South Junction Creek Water Users	Dam Enlargement	1958
Thornley K Swan	Stockwater	1977
Tooele County		
Grantsville City	Culinary Well	1978
Grantsville City	Culinary Tank	1996
Grantsville Irrigation Company	Dam/Reservoir	1983
Grantsville South Willow Irrigation Company	Pipe	1951
Grantsville South Willow Irrigation Company	Pipe	1964
Grantsville South Willow Irrigation Company	Pipe	1973
Hickman Creek Irrigation	Pipe	1960
Hickman Creek Irrigation	Pipe	1973
Lincoln Culinary Water Corp	Culinary Tank	1985
Lincoln Culinary Water Corp	Culinary Pipe	1993
Middle Canyon Irrigation Company	Pipe	1961
Middle Canyon Irrigation Company	Pipe	1972
Middle Canyon Irrigation Company	Pipe	1977
Middle Canyon Irrigation Company	Pipe	1986
Ophir Canyon Water Association	Culinary Pipe	1975
Ophir Canyon Water Association	Culinary Well	1993
Settlement Canyon Irrigation Company	Pipe	1948
Settlement Canyon Irrigation Company	Pipe	1973
Settlement Canyon Irrigation Company	Dam Repairs	1984
Soldier Canyon Water Company	Sprinkler	1977
Soldier Canyon Water Company	Diversion Dam	1983
Soldier Canyon Water Company	Pipe	1983
St. John Group	Stockwater	1978
St. John Irrigation Company	Sprinkler	1978
Stockton Town	Culinary Spring	1980
Terra Water Corp	Dual Water	1987
Vernon Irrigation Company	Canal Lining	1957
Vernon Irrigation Company	Dam/Reservoir	1972
Vernon Waterworks	Culinary System	1975
Water User's of Upper Clover Creek	Sprinkler	1977
Wendover City	Culinary Tank	1982
Juab County		
Callao Irrigation Company	Diversion Dam	1948
Millard County		
Snake Creek Irrigation Company	Pipe	1962
Total Projects 53		

Table 9-2
PROJECTED CULINARY M&I DEMAND AND SUPPLY FOR PUBLIC COMMUNITY WATER SYSTEMS
West Desert Basin

Name	Population Projection (2020)	Future Water Demand* (acre-feet/yr)	Existing Water Supply (acre-feet/yr)	System Capacity‡ (acre-feet/yr)	Surplus Deficit () (acre-feet/yr)
Box Elder County					
Grouse Creek	127	40	180	80	140
Howell Town Water Dist.	440	130	290	130	160
Snowville Waterworks Inc.	407	120	500	210	380
County Totals	974	290	970	420	680
Tooele County					
Dugway - English Village	1,700	500	3,360	1,390	2,860
Erda Acres Water Company	2,920	850	850	380	0
Golden Gardens	274	80	100	50	20
Grantsville Municipal Water	9,373	2,680	3,710	1,640	1,030
Lincoln Culinary Water	480	140	140	80	0
Ophir Canyon Water Assoc.	170	50	110	50	60
S & W Trailer Park	200	30	30	20	0
Silver Spurs Ranchos	60	20	30	20	10
Stansbury Park Imp. Dist.	6,790	1,940	4,240	1,840	2,300
Stockton Municipal Water	775	220	500	260	280
Tooele Municipal Water	33,690	8,000	7,830	3,240	(170)
Vernon Water Works	482	140	110	60	(30)
Wendover Municipal Water	1,688	482	3,550	1,530	3,068
County Totals	58,602	15,132	24,560	10,560	9,428
Juab County					
Goshute Indian Reservation	174	30	20	20	(10)
Millard County					
Eskdale	118	30	320	140	290
TOTAL	59,868	15,482	25,870	11,140	10,388

*Calculated demand for 2020 is based upon the Community Water System's current water use.
‡ The system capacity represents the volume of water, which when divided by the average annual water per capita use, gives the population that can be reliably served by the existing system under peak day demand conditions.

availability of late season irrigation water. Where population centers have developed, most communities have been far-sited in providing adequate municipal water supplies. For most of the basin's communities, meeting future M&I needs means improving and up-grading their existing delivery system. There are, however, instances of local water resources problems in the basin. These issues include: providing adequate M&I water system capacity, water quality, groundwater mining, groundwater contamination, drought and flooding concerns.

Residents in Snowville and Curlew Valley are concerned that developments in the northern end of the valley, in Idaho, will reduce their groundwater supply. An estimated 20,000 acre-feet of groundwater flows annually across the state line from Idaho into the Utah portion of Curlew Valley. Without some type of agreement between the states as to how to handle this problem, it has the potential to become a serious issue.

Residents in the Park Valley area and Grouse Creek area are searching for ways to stimulate their economy and promote growth. There has also been talk of creating a planned community in the Lucin area. These developments would increase the use of existing culinary water supplies and raise new water issues and problems for the area.

Grouse Creek

Tooele Valley is the most heavily populated area within the basin, and is projected to continue its rapid growth rate through the next couple of decades. The city of Tooele, with over 20,000 residents, is projected to have nearly 34,000 residents by the year 2020. Growth over the past few years has taxed Tooele City's existing supplies and raised concerns about meeting the future water needs. A couple of recent developments, however, have brightened Tooele City's future water supply outlook. The city acquired the culinary water supplies of the recently closed Tooele Army Depot. Also, Tooele City has drilled three new and highly productive wells. These developments have resolved the city's water supply problems for the present and immediate future. But, as can be seen from Table 9-2, Tooele City will still need to address its inadequate system capacity at some time in the near future. Other towns in the Tooele Valley are projected to experience similar growth rates but, as can be seen in Table 9-2, most have an adequate supply to meet their projected growth.

Residents of Eskdale have expressed concern that developments in southern Nevada have shown interest in tapping into unused groundwater supplies in Snake Valley. Their concern is that a mining of the Snake Valley groundwater could leave them with lowered water levels in their wells and reduced water quality.

9.4 WATER USE AND PROJECTED DEMANDS

Irrigated agricultural is the largest water use throughout the West Desert Basin. The current use of water for municipal and industrial purposes is small but increasing, particularly in the Tooele Valley and Wendover area. A summary of current and projected water demands is given in Table 9-3.

9.4.1 Agricultural Water

Irrigation water use has remained stable over recent years. Although there is a significant amount of undeveloped arable land in the basin, development of new irrigated lands has been limited by the short supply of surface water, particularly in the late season. Currently, irrigated land within the basin is 78,770 acres. This is projected to change very little by the year 2020. One exception will be in the Tooele/Rush Valley area where population increases will reduce the amount of existing agricultural land, and likely result in some agricultural water supplies being converted to municipal and industrial uses.

9.4.2 Municipal and Industrial Water Use

The basin's per capita municipal and industrial water use (potable and non-potable water use) delivered by the Community and Non-Community Water Systems is 260 gallons per person per day compared to the statewide average of 320 gallons per person per day. Figure 9-1 gives a graphic representation of the potable and non-potable water uses in the basin. Figure 9-2 shows the potable and non-potable uses in Tooele County. These numbers are more indicative of water uses in Tooele Valley,

Table 9-3

SUMMARY OF CURRENT AND PROJECTED WATER DEMANDS

West Desert Basin

(acre-feet/year)

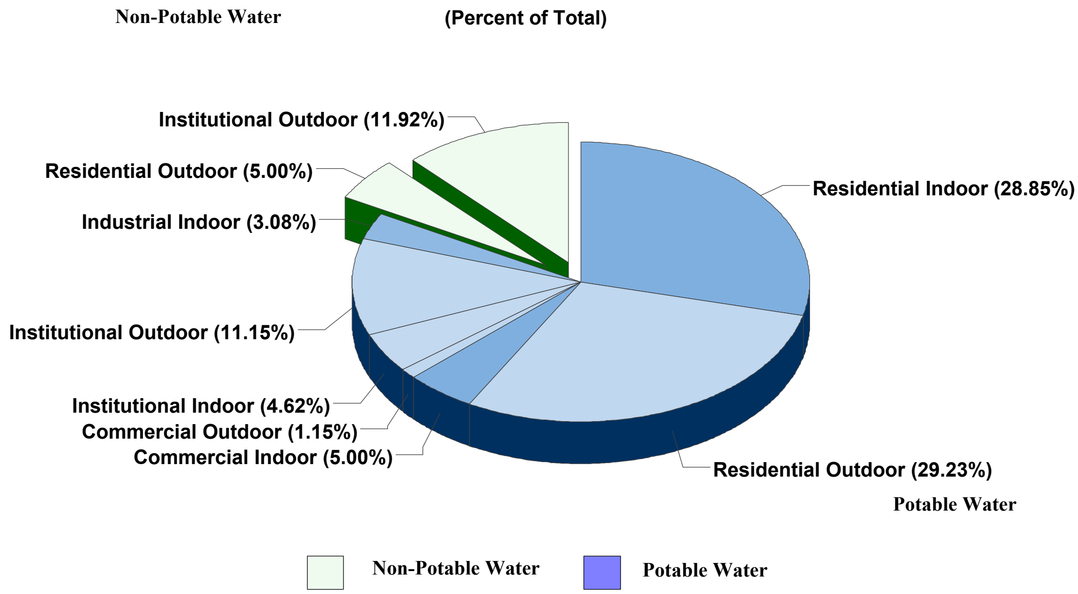
Use Category	Box Elder		Tooele		Juab		Millard		Total	
	1996	2020	1996	2020	1996	2020	1996	2020	1996	2020
Municipal & Industrial:										
Potable										
Residential[1]	198	281	5,092	11,137	47	73	28	41	5,365	11,532
Commercial/Institutional	75	106	1,922	4,204	18	27	11	15	2,026	4,352
Industrial	11	15	270	590	3	4	2	2	286	611
(sub-subtotal)	284	402	7,284	15,931	68	104	41	58	7,677	16,495
Self-Supplied Industrial	700	890	3,060	6,000	0	0	0	0	3,760	6,890
(sub-subtotal)	984	1,292	10,344	21,931	68	104	41	58	11,437	23,385
Non-Potable										
Residential/Institutional	58	82	1,483	3,245	14	21	8	12	1,563	3,360
Industrial	0	0	0[2]	0[2]	0	0	0	0	0	0
(sub-subtotal)	58	82	1,483	3,245	14	21	8	12	1,563	3,360
Total	1,042	1,374	11,827	25,176	82	125	49	70	13,000	26,745
Irrigated Agricultural	96,600	96,600	59,200	59,200	7,500	7,500	23,600	23,600	186,900	186,900
Basin Total	97,642	97,974	71,027	84,376	7,582	7,625	23,649	23,670	199,900	213,645

1: Includes Community Water Systems, Non-Community Water Systems, and Private Domestic

2: Does not include 10,000 acre-feet of export to Kennecott or 170,960 acre-feet of diversion of Great Salt Lake water for mineral extraction.

Figure 9-1

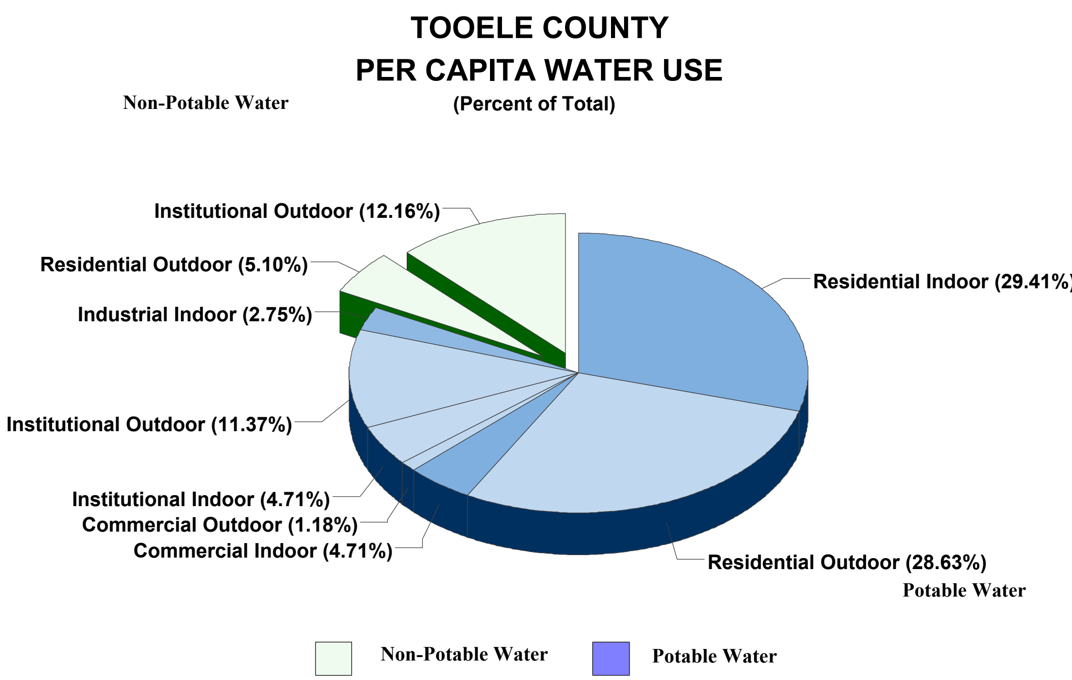
WEST DESERT BASIN
PER CAPITA WATER USE



WATER USE CATEGORY
PER CAPITA WATER USE
(gpcd)

Potable	
Residential Indoor	75
Residential Outdoor	76
Commercial Indoor	13
Commercial Outdoor	3
Institutional Indoor	12
Institutional Outdoor	29
Industrial Indoor	8
Sub-Total	**216**
Non-Potable	
Residential Outdoor	13
Institutional Outdoor	31
Sub-Total	**44**
TOTAL	**260**
Total Per Capita	
Residential	**164**
Commercial	**16**
Institutional	**72**
Industrial	**8**
Sub-Total	**260**
TOTAL	**260**

Figure 9-2

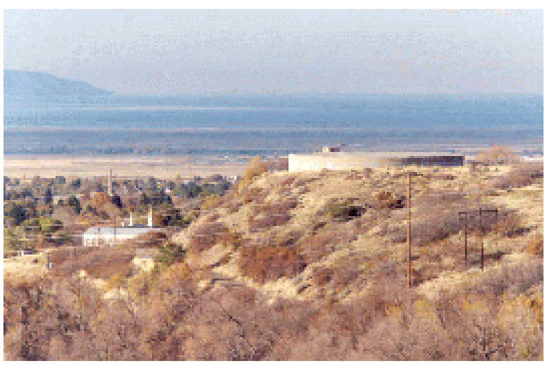


WATER USE CATEGORY
PER CAPITA WATER USE
(gpcd)

Potable	
Residential Indoor	75
Residential Outdoor	73
Commercial Indoor	12
Commercial Outdoor	3
Institutional Indoor	12
Institutional Outdoor	29
Industrial Indoor	7
Sub-Total	**211**
Non-Potable	
Residential Outdoor	13
Institutional Outdoor	31
Sub-Total	**44**
TOTAL	**255**
Total Per Capita	
Residential	**161**
Commercial	**15**
Institutional	**72**
Industrial	**7**
Sub-Total	**255**
TOTAL	**255**

home to more than 90 percent of the basin population. For Tooele County the total per capita M&I water use is 255 gallons per person per day. It is important to note that these per capita water use figures are developed from Community and Non-Community Water Systems. They do not include self supplied industrial or private domestic water use.

The basin's projected population for the year 2020 is 68,180 people. Based upon the current average of 260 gallons per person per day the basin's projected M&I water demand will be 19,855 acre-feet per year in 2020. Adding the projected self-supplied industrial water use puts the basin's total M&I water demand (potable and non-potable for 2020 at 26,745 acre-feet per year (See Table 9-3). The projected demand for potable M&I water (216 gpcd) in 2020, is 16,495 acre-feet per year. This is well within the basin's existing total potable M&I water supply of 30,810 acre-feet/year (See Table 5-5).


Water tank above town of Tooele

The basin's Community Water Systems will actually need something less than 16,495 acre-feet per year. This figure was calculated using the basin's total projected population for 2020. In reality there will undoubtedly still be many private domestic systems in the basin. Consequently, the basin's existing Community Water Systems, which collectively have an existing public water supply of 25,870 acre-feet (See Table 5-5), will have a more then adequate water supply for the year 2020. The basin's public drinking water supplies are discussed in more detail in Section 11, "Drinking Water."

Despite the basin's limited water resources, the municipal and industrial supplies for most communities are adequate to meet not only today's needs but the projected needs through 2020. This is because of the relatively small populations and because water purveyors have acquired adequate groundwater rights to provide for future M&I water needs. The exceptions are Tooele, Vernon, and and the Goshute Indian Reservation where existing supplies will not be adequate to meet the needs of their projected 2020 population (See Table 9-2). Projected shortages for these systems, however, are small and can likely be resolved easily through conservation, water development or acquisition of existing water rights. Three more systems, (Erda, Lincoln and the S&W Trailer Park) will be pushed to the limits of their existing water supplies by the year 2020.

Although most water purveyors have adequate water sources, many existing water systems have limited capacity to deliver the water. Consequently, while water supplies may not be a problem for most communities there will be a need for many communities to replace, update and enlarge their existing community drinking water distribution systems. Table 9-2 gives the current and projected public water supplies along with the reliable system capacities.

9.4.3 Secondary Water

There are a few communities currently making use of secondary (dual) water systems to extend their culinary water supplies. Current and projected secondary water use is shown in Table 9-3. The communities with secondary systems which serve at least a portion of the community, include Tooele, Grantsville, Vernon and Ophir in Tooele County and Snowville in Box Elder County. Secondary water use is also common at isolated residences where irrigation water is used to water yards and gardens, thus reducing the use of the private domestic system.

9.4.4 Recreational Water Use

All of the basin's reservoirs are quite small and provide little opportunity for boating or other water activity. Some do provide fishing opportunities and destination sites for camping, picnicking and other recreational activities. The Great Salt Lake is used for boating and sailing but access is primarily from the Great Salt Lake State Park and marina located in Salt Lake County. (See Section 15, Water-Related Recreation for more information.)

9.4.5 Environmental Water Needs

Water is used for riparian vegetation, wetlands maintenance and instream flows for fish and wildlife. Phreatophytes are also needed to provide cover and food for wildlife. Land use inventories have mapped 39,720 acres of wetlands in the West Desert basin and 24,810 acres of riparian habitat. There are also 685,940 acres of pickleweed barrens located primarily along the west and north shores of the Great Salt Lake and around the periphery of the Great Salt Lake Desert. These areas act as a natural filter removing some nutrients and other pollutants from the waters flowing through them. These areas also deplete a significant portion of the desert basins annual precipitation through evapo-transporation.

9.4.6 Water Depletions

The basin's total water depletions are summarized in Table 9-4. Culinary water depletions are typically forty percent of the culinary water use. Irrigated agricultural water and secondary water depletions typically run about sixty percent of the water diverted for use. As the basin's total water diversions increases from 194,700 to 202,745 acre-feet between 1995 and 2020, the total water depletions for the basin are projected to increase only about 2,500 acre-feet. This is primarily because the use of agricultural water in the basin is projected to decline somewhat over the next few decades as agricultural lands in the Tooele Valley are converted to municipal uses.

9.5 ALTERNATIVES FOR MEETING WATER NEEDS

Although water is scarce in the West Desert Basin there are still developable groundwater and surface water sources throughout much of the basin. The exceptions are Tooele Valley and the Snowville area which have been closed to the further appropriation of surface and groundwater. Any development of new surface water will likely mean the construction of a small reservoir to store springtime runoff
Although the basin does not have any large potential reservoir sites there are likely many locations where, if economically feasible, several hundred acre-feet of water could be captured and stored.

At the present time it is estimated that at least 12,000 acre-feet of water is exported from the Tooele county to Kennecott Corporation in Salt Lake County for industrial use. Kennecott's exported water comes from both surface and groundwater sources. Much of it is exported from the Lake Point area and is not of a particularly favorable quality. An estimated 2,000 acre-feet is diverted from the White Pine area of Middle Canyon, in the upper watershed of the Oquirrh Mountains which would make an excellent culinary water source. It is possible that with its recent modernization and improvements the Kennecott Corporation may not need all of the water it currently has rights to export from Tooele County. Perhaps through exchange, or the direct purchase of water rights, Tooele County or some other Tooele Valley water supplier could acquire some of this water as a culinary water source.

9.5.1 Conservation

There is potential to stretch existing water supplies through a number of conservation practices. Water users may be able to better manage their supplies thereby increasing efficiencies which in turn can reduce costs. This applies to all water uses including residential, commercial, industrial and agricultural. Conservation will not eliminate the

Table 9-4 **BASIN TOTAL WATER DIVERSIONS AND DEPLETIONS** West Desert Basin						
Use Category	1995		2020		2050	
	Diversions	Depletions	Diversions	Depletions	Diversions	Depletions
Municipal & Industrial						
Culinary	11,437	4,580	23,385	9,350	50,000	20,000
Secondary	1,563[1]	940	3,360[1]	2,020	7,300[1]	4,380
(subtotal)	13,000	5,520	26,745	11,370	57,300	24,380
Irrigated Agricultural	181,700	109,000	176,000	105,600	170,000	102,000
Reservoir evaporation	-	2,000	-	2,000	—	2,000
Basin Total	194,700	116,520	202,745	118,970	227,300	128,380

1. Does not include the saline water diverted from the Great Salt Lake for mineral extraction.

need for new development but could delay or reduce future projects. The state's goal of 12.5 percent water use reduction by 2020 and 25 percent by 2050 would help many of the basin's communities delay the need to increase system capacity. See Section 17 for more detail about water conservation.

9.5.2 Water Education

Water education provides an excellent vehicle to help children learn how to be responsible citizens. As they learn about water they gain a respect for a resource which will become more and more important as water-related issues become prominent. The purpose of the Division of Water Resources Water Education Program is to educate students (kindergarten through 12th grade) about water, where it comes from and where it goes. The children, in turn, learn to make decisions based on a knowledge of water and its availability.

Water Education is achieved through various means. The Division of Water Resources is the state's delegated custodian of the international water education program called Project WET (Water Education for Teachers). Project WET workshops are held throughout the state in order to train educators to use the collection of 90 innovative, interdisciplinary activities. Teachers are required to teach various aspects of water, and Project WET is a good tool for them to use. The program fits into a wide range of curriculum from science to social studies.

The water education program is expanding. The goal is to give educators the best resources the division can provide. Part of the program includes outreach to schools. School programs are presented on water-related topics which are required to be taught in the state curriculum. Water-related brochures and resources lists are also provided for educators. The Division of Water Resources has been active in sponsoring water fairs for both individual schools and for many schools at once. These water fairs will continue to be an important avenue to teach children about all aspects of water.

The annual Young Artists Water Education Poster contest is an event which continues to be the highlight of Water Education Month (October) of each year. Children (kindergarten through sixth grades) participate in this statewide contest. Themes chosen relate to water as a esource.

9.5.3 Weather Modification

Weather modification, or cloud seeding, has long been recognized as a means to enhance existing water supplies. Cloud seeding had its beginnings in 1946 at the General Electric Research Laboratories in Schenectady, New

York. Cloud seeding can assist nature in the formation of precipitation, with appropriate types and numbers of nuclei at the proper times and places. Cloud seeding projects have been carried out in over 20 countries. Projects are generally conducted either during the winter or summer months. While wintertime projects target the enhancement of mountain snow-pack within a watershed, summertime projects are aimed at enhancing precipitation and/or reducing damage from hail.

"Seeding" winter storm clouds over mountains is well established and understood. Clouds form as moist air is lifted and cooled during its passage across mountain ranges. Left to nature, many clouds are highly inefficient precipitators, retaining more than 90 percent of their moisture. By cloud seeding, the precipitation efficiency can be greatly improved. Generally, silver iodide is used in ground generators to produce artificial ice nuclei that form ice crystals. Spreading the nuclei via aircraft is also possible. These crystals attract moisture from the surrounding air forming droplets that grow large enough to fall to the ground as snow. Some projects using ground-based silver iodide generators to seed winter storms over mountain areas in the western United States have operated continuously since 1950.

Precipitation data from numerous cloud seeding projects have been examined in detail for evidence of downwind effects. Results from these analyses show a slight increase in precipitation in areas up to 90 miles downwind from the project area. No decrease in precipitation has been detected farther downwind from any long-term cloud seeding project.

The first cloud seeding project in Utah began in the early 1950s in the central portion of the state. Cloud seeding started again in 1973 and has continued to the present. In 1973 the Utah Legislature passed the Utah Cloud Seeding Act. This law provided for licensing cloud seeding operators and permitting cloud seeding projects by the Utah Division of Water Resources. The act states that for water right purposes all water derived from cloud seeding will be treated as though it fell naturally. The act also allowed for the division to sponsor and/or cost share in cloud seeding projects. Since 1976, the state through the Division and Board of Water Resources has cost shared with local entities for cloud seeding projects. Recent cost sharing by the board has been approximately 50 percent.

Clouds over the Oquirrhs

There are two winter time cloud seeding projects using silver iodide in the West Desert Basin. The West Box Elder project targets the watersheds of the Raft River Mountains and has operated for 9 years from 1989 to 1997. The project was started again in 2000. A project in East Tooele County targeting the watersheds of the Stansbury and Oquirrh Mountains has operated for 16 years. The project operated from 1976 to 1983, 1989 to 1992 and 1996 to the present.

A long term project has been operating in Central and Southern Utah. Statistical analyses of the Central and Southern Utah Project with over 20 years of operation and data indicate a December through March precipitation increase of about 15 percent and an April 1 snow water content increase of about 10 percent. Runoff analysis in Utah indicates a 10 percent increase in April 1 snow water content will result in a 10 to 20 percent increase in the April-July runoff depending on individual watersheds.

Cloud seeding is most effective when it is continued over several years, providing increased soil moisture, increased groundwater for springs and keeping up base flows. Seeding only in dry years may not be as effective because of a lack of seedable storm systems.

9.6 ISSUES AND RECOMMENDATIONS

9.6.1 Local Planning

Issue - Some communities are not adequately planning for future growth.

Discussion - Water purveyors need to plan for their community's future growth. Although there is not a lot of water in the West Desert Basin, most communities have secured a supply of drinking water that is more than adequate to meet their current needs and into the near future. There is however, a need throughout the basin for communities to address the inadequacies of their existing infrastructure. Many of the basin's community drinking water systems are currently operating at or near their capacities. While these communities may have adequate supplies and could improve system capacity to deliver more water, it may be advantageous for them to consider conservation measures that could reduce the demand and delay the need for improvements. Sooner or later water conservation will need to be an integral part of each community's water management plan. Not only is it prudent for communities to consider water conservation measures, it is now a requirement for water suppliers with more than 500 connections to submit a water conservation plan to the state. The present advice from water planners throughout the United States is to estimate community growth for the next 50 years. Community leaders should then plan for a combination of water supply, water quality and conservation strategies that will provide an integrated structural and non-structural program to meet their projected needs.

Various scenarios can be explored to consider all the options available to the communities. Least-cost analysis may be used, with water conservation and environmental impacts given full consideration . Groundwater sources will be considered along with conversion of agricultural water and water conservation through better efficiencies within and outside timely action for the future quality of life.

Recommendation - All communities and water utilities should prepare a long-term water management plan which includes new water supply sources, upgrading infrastructure and water conservation programs. To encourage the community's homes.

The plan should be reappraised periodically. By updating population projections, reevaluating new conservation methods as they become available, those responsible for water delivery will be alerted to problems that are beyond their term of office and yet require management and conservation planning, communities and water utilities should increasingly be expected to prepare these management plans before federal or state funds are awarded.

Contents

Section 10

West Desert Basin

Agricultural Water

10.1 INTRODUCTION

This section describes the agricultural water use in the West Desert Basin. It also identifies and discusses key issues associated with agricultural water conservation. Also, some proposed solutions to the problems and needs of the area are presented.

Agriculture is a major industry in the basin and as such it has a direct impact on the economy of the area. Spinoff from agriculture helps support employment and production in other sectors along with providing economic diversity.

Callao

10.2 BACKGROUND

Historically, agriculture has played a key role in the basin's economy. Today there are 78,700 acres of irrigated crop land within the basin, and just over 123,700 acres of dry-cropland. While agriculture continues to be a significant source of income throughout much of the basin, Tooele Valley and Wendover have come to rely upon service and industry related jobs to fuel their economies. The close proximity of Tooele Valley to populated Salt Lake City has created suburban type settings with many residents commuting to work in service or industry related fields. Still, even in these suburban areas, agricultural water use plays an important role in overall water planning, both in terms of quantity and quality. In many of the basin's smaller communities--from Snowville, Park Valley, and Grouse Creek in the north, to Callao, Partoun, Eskdale, and Garrison in the south--agricultural water is a key element to economic survival.

> Throughout the West Desert Basin, the greatest limitation to agricultural development and production is the availability of water. There are approximately a million acres of arable land in the basin. Most of that land is not being cultivated because of the limited water supply.

Although much of the Great Salt Lake Desert and surrounding lands are too saline or otherwise unsuitable for crop production, there are large tracts of arable land where crops could be cultivated if there were a dependable water supply or sufficient precipitation. These potentially productive agricultural lands are located primarily along the mountain benches throughout the basin. The limiting factor for agricultural production throughout the basin, however, is the availability of water. Most mountain streams are intermittent and phemeral, providing very little, if any, late season water. Where perennial streams do exist, their flows have already been fully appropriated.

10.3 AGRICULTURAL LANDS

A land use inventory of the Columbia River Basin was conducted by the Division of Water Resources. This study used 1989 aerial photography to map various land use types. Published in 1991, the study is entitled "Water Related Land Use Inventories - Columbia Basin." It identified 100 acres of residential/commercial/industrial ground, 4,870 acres of surface irrigated lands, and 1,850 acres of dry-cropland. The total agricultural ground was 7,060 acres.

In the early 1990s, a land use inventory of the Great Salt Lake Desert was conducted by the Division of Water Resources. This study used 1989 aerial photography to map various land use types. Published in 1993, the study is entitled "Water Related Land Use Inventories, Great Salt Lake Desert Unit." It identified 13,080 acres of residential/commercial/industrial ground, 73,830 acres of irrigated lands, 14,620 acres of idle/fallow ground and 121,870 acres of dry-cropland. The total agricultural ground was 210,320 acres. The basin's agricultural lands are summarized in Table 10-1. The location of the agricultural lands is shown in Figure 10-1.

10.3.1 Irrigated Cropland

The type and distribution of the irrigated crops are given in Table 10-1. The majority of irrigated lands are used for the production of feed for cattle. Irrigated pasture land accounts for 35 percent, while alfalfa makes up 40 percent, of the irrigated ground. Various grains, corn and hay, as well as idle and fallow ground make up much of the remainder. Less than a tenth of one percent of the irrigated ground is used to produce high cash crops such as fruits and vegetables.

Irrigation water use has remained relatively stable over the past 50 years, fluctuating with the wet and dry climate cycles. The effects of the short-term cycles are dampened where surface water storage facilities are available. (See Table 6-1 for locations of existing reservoirs.) An estimated 181,700 acre-feet is diverted each year to irrigate the basin's 78,700 acres of irrigated ground. It is estimated that 109,000 acre-feet of the diverted water is depleted. For a complete breakdown of estimated diversions and depletions see Table 10-2.

Alfalfa field (Tooele Valley)

10.3.2 Dry Cropland

As with the irrigated lands, dry croplands are primarily used for the production of feed grains. There are over 123,700 acres of dry-cropland in the basin. More than 50 percent more land is being dry-cropped than irrigated. However, nearly 110,000 acres or 90 percent of the basin's dry-cropland is in the Blue Creek Valley and Curlew Valley areas. The fact that, outside of the Blue Creek Valley/Curlew Valley area, the West Desert Basin has just over 10,000 acres of dry-cropland attests to the dry nature of the region, and the need for a dependable source of irrigation water to make a success of any agricultural endeavor. Although there are undeveloped arable lands in the basin, it is not likely that there will be a significant increase in dry cropland or irrigated cropland acreage.

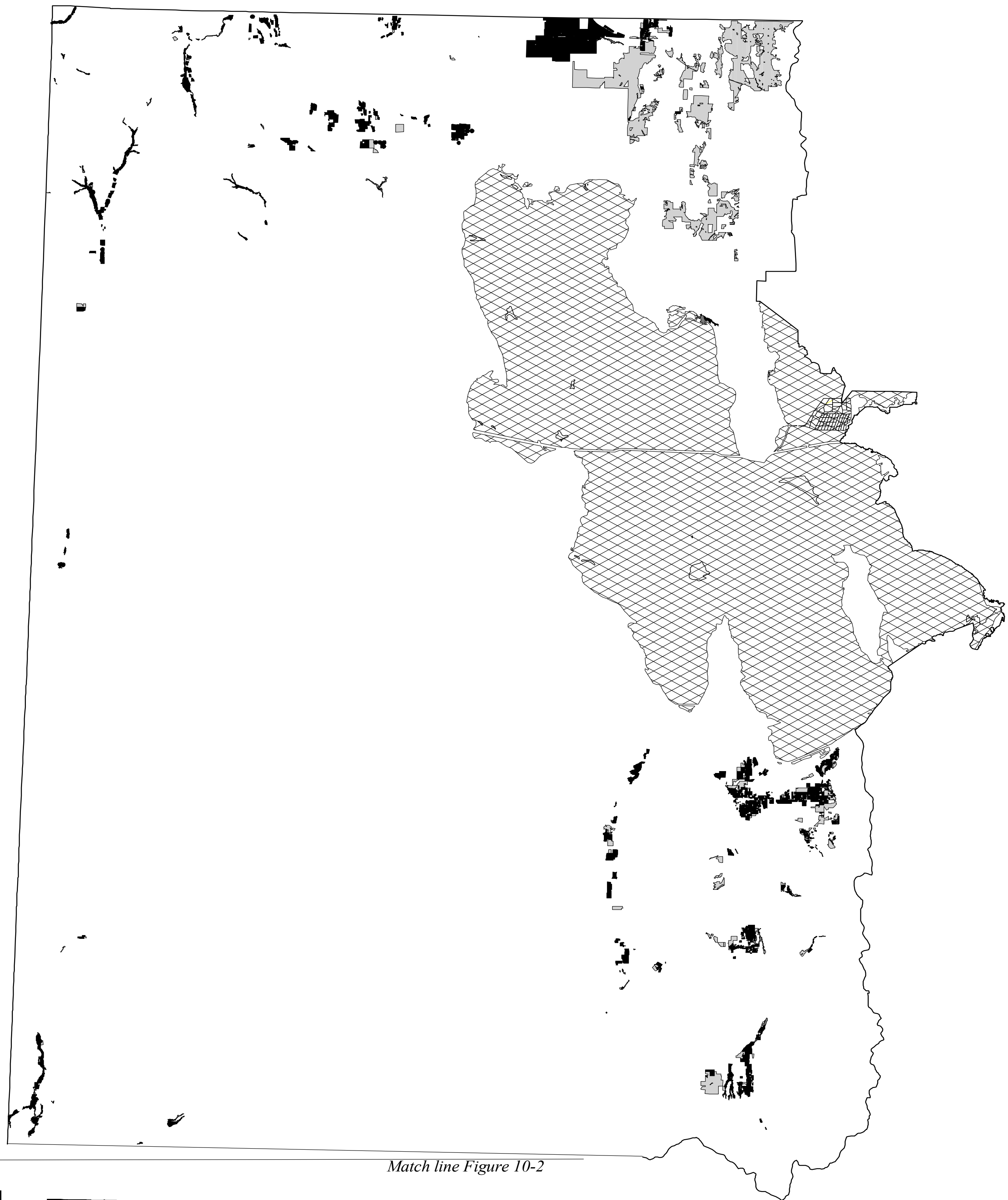
10.3.3 Rangeland

Rangelands comprise the largest segment of agricultural land with nearly 1.2 million acres or about 10 percent of the total basin area. Some

Table 10-1
AGRICULTURAL LAND BY CROP
West Desert Basin
(acres)

Crop Type	Box Elder County						Great Salt Lake Desert				Tooele Valley	Rush Valley	Total
	Columbia Basin	Grouse Creek	Park Valley	Curlew Valley	Blue Creek Valley[1]	Lucin	Goshute Valley	Snake Valley	Callao/ Trout Creek	Skull Valley			
Alfalfa	1,770	2,110	3,310	10,220	1,240	220	250	2,580	550	1,550	4,670	2,800	31,270
Irrigated pasture	960	1,310	1,600	540	5,510	234	3,970	3,590	1,290	510	4,920	3,890	28,324
Grain	700	230	1,390	5,230	1,350	0	20	510	0	50	2,790	510	12,780
Corn	0	0	0	0	0	16	0	10	40	0	380	0	446
Grass/turf	0	0	0	0	0	0	0	0	0	0	0	80	80
Grass/hay	1,440	460	1,090	250	230	0	0	20	920	50	1,020	290	5,770
Fruits	0	0	0	0	0	0	0	20	0	0	5	0	25
Potatoes	0	0	0	0	0	0	0	0	0	0	5	0	5
Irrigated Acres	4,870	4,110	7,390	16,240	8,330	470	4,240	6,730	2,800	2,160	13,790	7,570	78,700
Dry-Cropland[2]	1,850	1,290	2,380	25,050	84,100	0	70	0	1,410	580	5,840	1,150	123,720
Cultivated Land	6,720	5,400	9,770	41,290	92,430	470	4,310	6,730	4,210	2,740	19,630	8,720	202,420
Idle/Fallow	340	670	1,300	4,840	280	80	540	1,010	900	140	2,130	2,730	14,960

Data from: Water-Related Land Use Inventories - Great Salt Lake Desert Unit, Utah Water Resources, November 1993.
Water-Related Land Use Inventories - Columbia Basin, Utah Water Resources, June 1991.
1.) Includes Hansel Valley and Promontory.
2.) Dry-cropland acres were mapped as a part of the water-related land-use inventories. It is possible isolated dry-cropland acres were missed and the actual dry-cropland acreage figures could be higher.



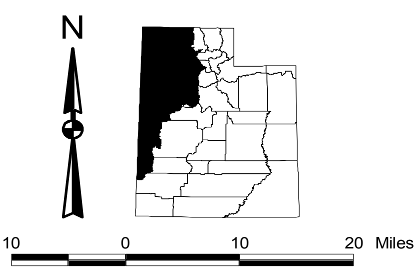


Figure 10-1

AGRICULTURAL LANDUSE

West Desert Basin
(Northern Portion)

Land Use
- Irrigated
- Dry Crop
- Wetlands
- Water
- Basin Boundary

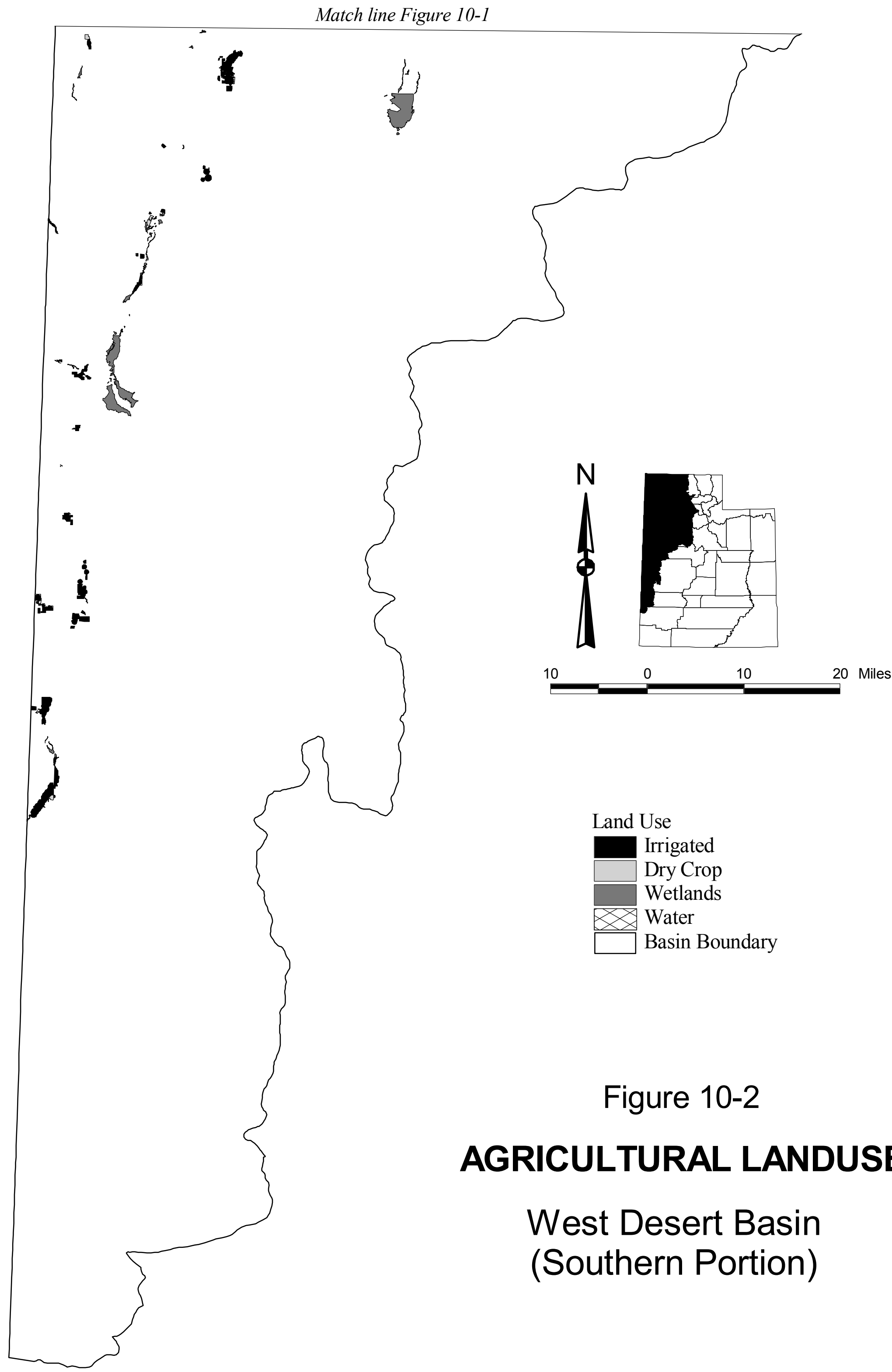


Figure 10-2

AGRICULTURAL LANDUSE

West Desert Basin
(Southern Portion)

Table 10-2 **IRRIGATION WATER USE AND DEPLETION** West Desert Basin			
Subbasin	Area (acres)	Estimated Diversion (acre-feet/year)	Estimated Depletion (acre-feet/year)
Columbia Basin	4,870	12,200	6,400
Grouse Creek	4,110	8,700	6,700
Park Valley	7,390	15,000	11,400
Curlew Valley	16,240	36,200	23,500
Blue Creek Valley[1]	8,330	19,700	11,700
Lucin	470	2,300	1,200
Deep Creek Valley	4,240	7,100	4,500
Snake Valley	6,730	23,600	12,500
Callao Trout Creek	2,800	6,000	4,600
Skull Valley	2,160	6,000	4,100
Tooele	13,790	24,500	12,200
Rush Valley	7,570	20,400	10,200
Total	78,700	181,700	109,000

Source: Land-use survey and water budgets, Division of Water Resources
1.) Includes Hansel Valley and Promontory

of this land is located in the mountainous regions and is forested, but large areas of grazing lands are located in the arid and semi-arid valleys. These areas are often used for winter grazing. In some areas, work has been done to increase livestock and wildlife foraging on rangelands through chaining the standing growth of sagebrush and pinyon-juniper cover and reseeding with grass.

10.3.4 Watershed Management

Watershed management is the protection, conservation and use of the natural resources of a watershed in such a way as to keep the soil mantle in place and productive. It also assures water yield and water quality meet the existing and potential uses. If not properly protected, watershed lands are readily damaged from erosion, floods, sediment deposition and fire. The following are some of the treatment measures that can be used in the West Desert Basin Plan to keep, protect and enhance the watershed:

- Wildlife management;
- Sound grazing evaluation and management practices.
- Vegetation improvement on cropland, rangeland, forest land, pasture land, wetlands, riparian zones and other areas;
- Conservation tillage protection on cropland in the lower watershed coordinated with grazing management; improved cropping sequences, pasture and hay land management and improved irrigation systems and management are important;
- Structural measures, such as contour trenching, debris basins, gully control, and stream channel stabilization, all in conjunction with vegetation improvement;

- Spring areas protected from wildlife by fencing. Watering facilities provided outside the fenced areas;
- Controlled burns.

10.4 AGRICULTURAL WATER PROBLEMS AND NEEDS

The most significant water problem in the West Desert basin is the lack of adequate water supply, particularly late in the growing season. Less of a problem, but also of concern, is erosion and sedimentation.

10.4.1 Irrigation Water

Throughout the basin, agricultural water supplies are scarce particularly in the late summer and early fall months of the year. Historically, surface water supplies have been developed for agricultural uses but most of the basin's surface water sources are intermittent streams that tend to provide little or no flow in the late summer and early fall. Several small reservoirs have been built in the basin to store winter and spring runoff for use in the late irrigation season. Also in many areas, agricultural water supplies have been augmented with groundwater. Still much of the basin's agricultural lands have an inadequate supply of irrigation water.

Where flood irrigation is still being used there is the potential to improve application efficiencies by converting to sprinkler irrigation systems or surge systems. This could stretch supplies stored in reservoirs into the latter part of the season.

10.4.2 Erosion

Any improper practice using land beyond its capabilities contributes to erosion. Examples include excess tillage, improper road and trail location, and changes in natural stream regimen. The increased off-road use of 4-wheel drive vehicles, ORVs and motorcycles also increases erosion. Tracks made in soft or wet soil can develop into small gullies and increase erosion.

10.4.3 Sedimentation

Sedimentation can be spectacular as a result of a cloud-burst event, or can be the result of perennial stream flow over a long period. Cost incurred from each type of sedimentation can be significant. Sedimentation damages irrigation facilities by depositing materials in reservoirs, diversion structures, and canals and require continuous clean-out. Sediment can also be deposited on the irrigated lands.

10.5 CONSERVATION AND DEVELOPMENT ALTERNATIVES

There are a number of water conservation practices that could be employed to increase water use efficiencies. These include: improving diversion structures, lining high seepage loss canal sections, converting from flood irrigation to sprinkler or trickle applications, and improved management.

Water use efficiency improvement is one way to realize additional monetary benefits from an existing supply. Delivery systems can be upgraded by lining high seepage areas in canals with concrete or plastic lining and by installing pipelines. Improving or rebuilding diversion structures and effective measurement and management controls can also increase efficient use of water. This could include use of real-time stream gaging station data.

On-farm irrigation efficiency improvements are a way to reduce the increasing contamination of the groundwater reservoirs. If water is applied more efficiently, less will be used and the deep percolation to groundwater will be reduced. This will decrease the volume of total dissolved-solids removed from the soils and conveyed into the groundwater.

Contents

Section 11

West Desert Basin

Utah State Water Plan

Drinking Water

11.1 INTRODUCTION

This section describes the public water systems (PWS) in the West Desert Basin, discusses present and future problems and presents estimated future requirements. Although titled "Drinking Water," this section addresses public potable water supplies distributed not only for drinking but for other public uses. Typical uses include indoor home use, outdoor home use, lawn and garden watering, car washing, swimming pools, public parks and streets, fire protection, commercial enterprises and schools. Also, some industries receive water from municipal water systems. Industrial water use is discussed in Section 18.

11.2 SETTING

Public drinking water supplies throughout the basin come principally from wells (79 percent) and to a lesser extent from springs (21 percent). There are no surface water treatment plants in the basin. See Table 11-1 for potable water supplies for Community Water Systems. It is anticipated that new drinking water sources in the foreseeable future will come from groundwater supplies, either wells or springs, since they are more reliable and less expensive to develop than surface water sources and generally do not require the expensive treatment processes that surface waters do.

State of Utah Administrative Rules for Public Water Systems define a PWS as a water system that has at least 15 connections or serves an average of at least 25 individuals at least 60 days per year. Private water systems such as self-supplied industrial facilities, and individual home wells or springs, are not subject to these rules. PWS are further categorized as Community Water Systems (CWS) or Non-Community Water Systems (NCWS). A CWS serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. A NCWS is categorized as either a non-transient non-community water systems (NTNCWS) or transient non-community water systems (TNCWS). NTNCWS regularly serve at least 25 of the same nonresident persons per day for more than six months per year. Examples include water systems that serve churches, schools, and work places. TNCWS regularly serve at least 25 different nonresident persons per day for more than six months per year, and do not serve the same 25 nonresidents each day. Examples include campgrounds, restaurants, and retail stores with fewer than 25 permanent nonresident staff. In simplistic terms, NTNCWS generally serve the same people every day whereas TNCWS serve different people every day. The State of Utah Division of Drinking Water designates each CWS, NTNCWS, and

> Because of the limited surface water supply, towns and isolated residents throughout the basin are dependent upon groundwater for culinary water supplies. Virtually all of the basin's drinking water presently originates from wells or springs.

Table 11-1
POTABLE WATER SUPPLIES FOR COMMUNITY WATER SYSTEMS
West Desert Basin

Water Supplier	Springs (ac-ft/yr)	Wells (ac-ft/yr)	Total (ac-ft/yr)
Box Elder County			
Grouse Creek	100	80	180
Howell Town Water Department	20	270	290
Snowville Waterworks Inc.	0	500	500
County Totals	120	850	970
Tooele County			
Dugway - English Village	0	3,360	3,360
Erda Acres Water Company	0	850	850
Golden Gardens	0	100	100
Grantsville Municipal Water	0	3,710	3,710
Lincoln Culinary Water	80	60	140
Ophir Canyon Water Assoc.	60	50	110
S and W Trailer Park	0	30	30
Silver Spurs Ranchos	0	30	30
Stansbury Park Imp. Dist.	0	4,240	4,240
Stockton Municipal Water	400	100	500
Tooele Municipal Water	1,200	6,630	7,830
Vernon Water Works	0	110	110
Wendover Municipal Water	3,550	0	3,550
County Totals	5,290	19,270	24,560
Juab County			
Goshute Indian Reservation	0	20	20
Millard County			
Eskdale	0	320	320
Basin Totals	5,410	20,460	25,870

Source: Municipal and Industrial Water Supply and Use in the Columbia and Great Salt Lake Desert Basins (March 1997), Utah Division of Water Resources.

TNCWS as “approved,” needing “corrective action,” or “not approved” on the basis of compliance with various federal regulations and State rules for drinking water systems.

Presently, surface water supplies are regulated to a much greater degree than groundwater or spring water supplies. All surface water supplies require minimum treatment in the form of disinfection against waterborne, disease-causing organisms and viruses. Additionally, filtration is frequently mandated as a secondary barrier against their occurrence in water distribution systems.


Water Storage Tank

Community water systems generally serve both municipal and industrial (M&I) users. While not all industrial users require culinary quality water, the bulk of the water used for industrial purposes is, in fact, of culinary quality because of the convenience of using the local community water system.

Over the past 40 years, the Division of Water Resources and the Division of Water Rights has collected M&I data. In recent years, these studies have become more comprehensive. When the Division of Water Resources began statewide water planning in the 1960s, studies focused mainly on supplies and uses throughout the state. At that time, agriculture uses far exceeded M&I water uses. The latter only accounted for about 5 percent of the total water use. But by the early 1980s, M&I diversions made up 15 percent of the statewide total and the entire water community became increasingly focused on M&I water supplies and uses.

11.2.1 Background

The development of a domestic water supply in the West Desert Basin began with the first settlers in Tooele Valley in 1849. Early settlers established residences near existing streams and diverted stream flows and spring flows for their domestic and agricultural uses. Later, extensive use was also made of well water for domestic uses.

Most of the incorporated towns operate CWS that distribute water collected from a system of wells and/or springs. These systems deliver water for both culinary uses and fire suppression. In the rural areas, private wells provide potable water for individual homes and farm operations. The Division of Water Rights has enacted a moratorium on new groundwater permits in the Tooele Valley and this situation is expected to continue into the foreseeable future.

11.2.2 Current Water Supplies

There are currently 18 community water systems in the West Desert Basin (See Table 11-2). Most of the community water systems in the basin are located in two counties: Box Elder County (4), and Tooele County (14). Millard County has one CWS. There is only one community water system in Juab County, located on the Goshute Indian reservation in the northwest corner of the county. The Goshute Indian Reservation water system is in a special class of PWS (one of several in Utah). It is regulated only by the U.S. Environmental Protection Agency and not the State of Utah. There are no CWS within the basin in either Beaver or Iron counties. Figure 11-1 shows the location of the basin’s community water systems. Table 11-2 lists the basin’s public community drinking water systems and gives a breakdown of the water uses provided by each. The basin’s community water systems provide a total of 25,870 acre-feet of potable water.

Table 11-2
PUBLIC COMMUNITY
DRINKING WATER SYSTEMS
West Desert Basin

Name	Population served	Potable Water Use (ac-ft/yr)					Average Per Capita Use (gpcd)	Water Supply (ac-ft/yr)	System Capacity (ac-ft/yr)
		Residential Use	Commercial Use	Institutional Use	Industrial Use	Total M&I Use			
Box Elder County									
Grouse Creek	75	28	0	1	4	33	393	180	80
Howell Town Water Dept.	200	42	0	0	0	42	188	290	130
Snowville Waterworks Inc.	250	108	28	7	16	159	568	500	210
County Totals	525	178	28	8	20	234	398	970	420
Tooele County									
Dugway - English Village	1,090	186	0	607	0	793	651	3,360	1,390
Erda Acres Water Company	278	53	0	0	0	53	170	850	380
Golden Gardens	140	22	0	0	0	22	140	100	50
Grantsville Municipal Water	5,000	965	76	78	43	1,162	208	3,710	1,640
Lincoln Culinary Water	400	68	0	11	0	79	176	140	80
Ophir Canyon Water Assoc.	149	23	0	9	0	32	192	110	50
S and W Trailer Park	200	16	0	0	0	16	71	30	20
Silver Spur Ranchos	30	10	0	0	0	10	298	30	20
Stansbury Park Imp. Dist.	2,100	416	147	22	4	589	250	4,240	1,840
Stockton Municipal Water	450	247	4	4	5	260	516	500	260
Tooele Municipal Water	17,000	2,391	150	523	180	3,244	170	7,830	3,250
Vernon Water Works	200	41	0	23	0	64	286	110	70
Wendover Municipal Water	1,600	312	113	43	8	476	266	3,550	1,530
County Totals	28,637	4,750	490	1,320	240	6,800	212	24,560	10,580
Juab County									
Goshute Indian Reservation	111	12	0	1	0	13	105	20	20
Millard County									
Eskdale	85	25	0	8	0	33	347	320	140
Basin Totals	29,358	4,965	518	1,337	260	7,080	216	25,870	11,160

Source: Municipal and Industrial Water Supply and Use in the Columbia and Great Salt Lake Desert Basins (March 1997), Utah Division of Water Resources.

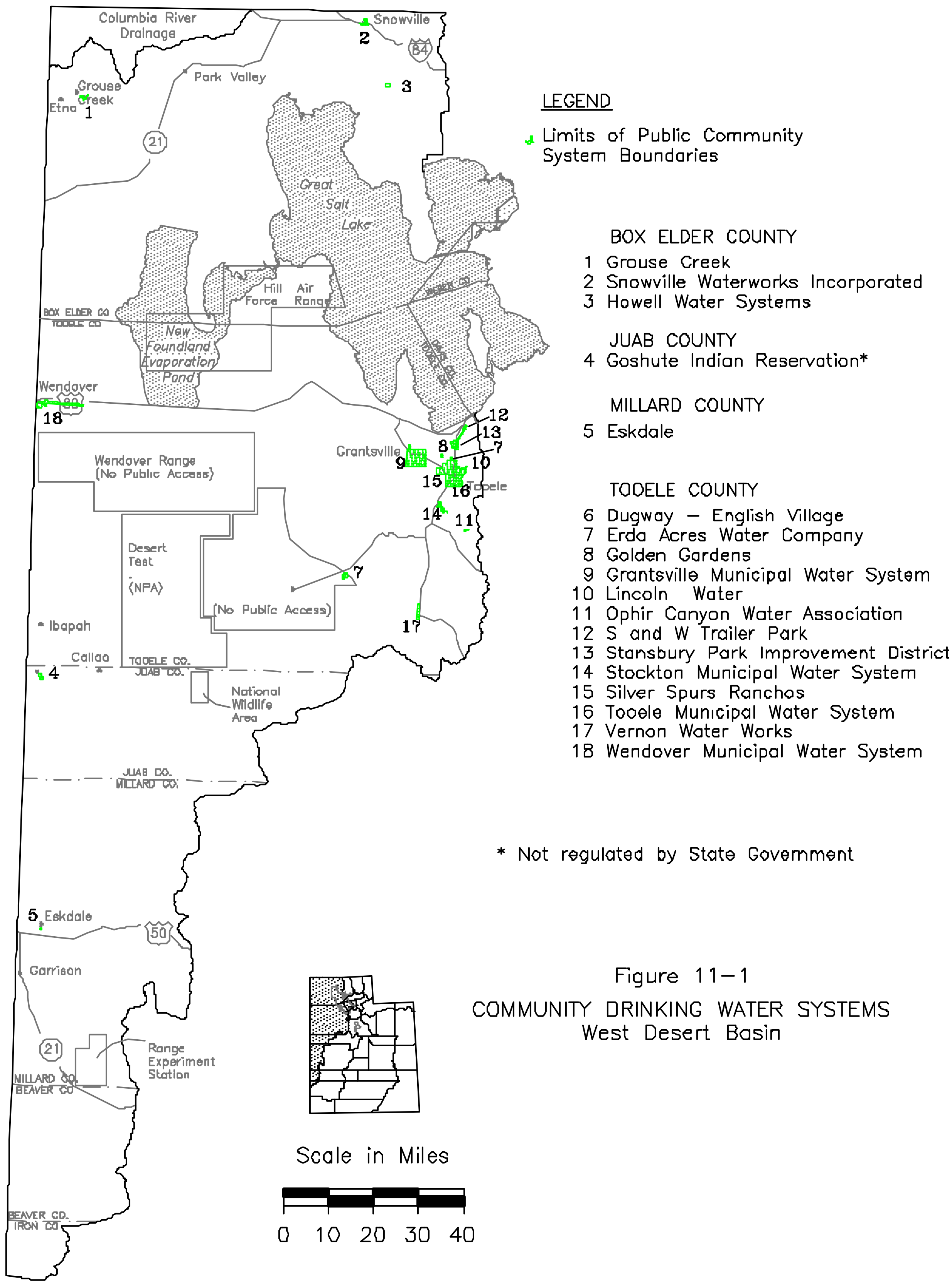


Figure 11–1
COMMUNITY DRINKING WATER SYSTEMS
West Desert Basin

There are an additional 18 non-community water systems providing an additional 490 acre-feet of potable water annually. These non-community water systems serve a national monument, a state park, campgrounds, isolated commercial establishments and roadside rest stops. It is estimated that private domestic systems in the basin provide 692 acre-feet annually. The basin's self-supplied Industrial water supply is 3,760 acre-feet per year. Collectively the basin's non-community water systems, private domestic systems and self-supplied industrial water sources provide an 4,940 acre-feet of potable water per year. (See Table 11-3).

11.3 ORGANIZATIONS AND REGULATIONS

Although public drinking water supplies are subject to compliance with both state rules and federal regulations that pertain to the Safe Drinking Water Act, it is the towns, cities and counties that have primary responsibility for drinking water supplies within their boundaries. Their responsibility and authority are specified in Titles 10, 11, 17, 19, and 73 of the *Utah Code Annotated, 1953, amended.*

11.3.1 Local

Water systems throughout the basin are of varied type. They include municipal water systems of towns and cities, special governmental entities such as combined water and sewer districts, and private water companies. Each system is dependent upon one or more water sources in the form of springs or wells.

11.3.2 State

The Division of Drinking Water is the state agency responsible for regulating and monitoring public water systems. By action of the 1991 Utah Legislature, effective July 1, 1991, the Department of Environmental Quality (DEQ) was created, and the Bureau of Drinking Water/Sanitation in the Department of Health was elevated to the Division of Drinking Water in the new DEQ.

All public drinking water supplies are subject to the Utah Safe Drinking Water Act and Utah's Administrative Rules for Public Drinking Water Systems. Federal regulations and state rules are administered by the Department of Environmental Quality, Division of Drinking Water. This authority is vested in the Utah Drinking Water Board which has regulatory control over public and private drinking water systems. The Board promulgates the state rules that the Division of Drinking Water administers. When non-public systems are at issue, local health departments are the responsible regulatory authorities. However, the Division of Drinking Water is empowered to review any water system and may act any time in the state's interest. The State Division of Water Rights administers the Utah Administrative Rules for water well drillers but the Division of Drinking Water reviews the engineering design and construction of wells.

The Utah Safe Drinking Water Act includes rules designed to: 1) establish standards for drinking water quality; 2) establish standards and necessary actions for the design and construction of new and expanded water treatment and conveyance facilities; 3) protect watersheds, well heads, and other public water source areas; 4) provide technical and financial assistance to train operators, construct new treatment and distribution facilities, and renovate existing ones; 5) administer federal programs that provide technical and financial assistance to local water agencies; 6) carry out emergency plans when natural disasters contaminate public drinking water supplies; and 7) provide enforcement of both state rules and federal drinking water regulations.

The federal government requires that state rules, at a minimum, reflect the same standards as the federal regulations. Utah's rules are more stringent where the Drinking Water Board and Division of Drinking Water have concluded that federal regulations do not adequately

Table 11-3

WATER USE FOR PUBLIC NON-COMMUNITY SYSTEMS, SELF-SUPPLIED INDUSTRIES AND PRIVATE DOMESTIC SYSTEMS

West Desert Basin

Non-Community Systems	Potable Use				
	Residential Use (ac-ft/yr)	Commercial Use (ac-ft/yr)	Institutional Use (ac-ft/yr)	Industrial/ Stockwater Use (ac-ft/yr)	Total Potable Use (ac-ft/yr)
Box Elder County					
Golden Spike National Monument	0	0	2	0	2
Lakeside Range	1	0	2	0	3
Palmer Twin Motel	1	2	0	0	3
Park Valley Latter-day Saint Church	0	0	4	0	4
Park Valley School	0	0	14	0	14
Self Supplied Industries	0	0	0	700	700
Private Domestic	160	0	0	0	160
County Totals	162	2	22	700	886
Tooele County					
Delle Auto/Truck Stop	0	3	0	0	3
Dugway - Carr Facility	0	0	14	0	14
Dugway - Ditto Tech Center	0	0	143	0	143
Dugway Ward	0	0	6	0	6
Erda Ward	0	0	3	0	3
Ibapah Latter-day Saint Church	0	0	3	0	3
Ibapah School	0	0	3	0	3
Lakepoint Ward	0	0	3	0	3
Motor-Vu Theater	0	2	0	0	2
Rush Valley Latter-day Saint Church	0	0	3	0	3
Salt Flats Highway Rest Stop	0	0	3	0	3
Deseret Chemical Depot	0	0	69	205	274
Self Supplied Industries	0	0	0	3,060	3,060
Private Domestic	470	0	0	0	470
County Totals	470	5	250	3,265	3,990
Juab County					
West Desert School	0	0	4	0	4
Self Supplied Industries	0	0	0	0	0
Private Domestic	40	0	0	0	40
County Totals	40	0	4	0	44
Millard County					
Self Supplied Industries	0	0	0	0	0
Private Domestic	20	0	0	0	20
County Totals	20	0	0	0	20
Basin Totals	692	7	276	3,965	4,940

Source: Municipal and Industrial Water Supply and Use in the Columbia and Great Salt Lake Desert Basins (March 1997), Utah Division of Water Resources.

address the public's interest in some manner. An example is the requirement to disinfect water from a well that might not require disinfection under federal regulations.

Maximum contaminant levels (MCLs) for primary and secondary treatment processes have been established by the Utah Drinking Water Board. Primary standards apply to treatment requirements to protect public health and safety while secondary standards apply to maintenance of water aesthetics such as taste, odor, and turbidity.

The Division of Drinking Water also administers water system infrastructure construction funding through the State Revolving Fund. This fund is used to construct new water systems and repair existing treatment and distribution facilities. Construction funds are allocated in four ways: low interest loans, direct grants, interest buy-downs, and credit enhancements. The State Revolving Fund Program was established by Congress and is funded through the EPA. Utah received an allocation of $9.8 million in 1998, and $6.0 million in 1999, and should receive $6.5 million in 2000 and between $6.0 and $6.5 million every year thereafter through 2003. Some of these funds will be used to comply with the 1986 Safe Drinking Water Act (SDWA) Amendments directives on wellhead protection programs for the 50 states.

The Drinking Water Board has created the Drinking Water Source Protection Rule (DWSPR), which outlines general requirements to protect drinking water aquifers from surface contamination. Requirements of the DWSPR obligate community water systems to prepare a Drinking Water Source Protection Plan for each groundwater source in public water systems. DWSPR also requires proof of ownership and maintenance of all land in, and around, wellheads where surface pollution could contaminate groundwater. Monitoring programs established by state rules and federal regulations are used to determine if public water systems are meeting standards. Procedures are outlined in the State Administrative Rules for Public Drinking Water Systems.

The state rules outline Utah's responsibility to collect and test water samples to monitor the quality of existing drinking water supplies. The rules also outline how community water systems must document to the Division of Drinking Water that sampling requirements are being fulfilled. The rules also set maximum contaminant levels and codify a source of funding for the design, construction, and operation of drinking water treatment and distribution facilities. The state rules also provide for submission of Drinking Water Source Protection Plans to ensure that community water systems comply with the rules.

11.3.3 Federal

With the passage of the federal Safe Drinking Water Act (SDWA) in 1974, the federal government established national drinking water regulations to protect the public from waterborne diseases. Congress expanded and strengthened the SDWA in 1986. These SDWA Amendments significantly increased the responsibility of the Environmental Protection Agency (EPA) to: 1) establish maximum levels of contamination for established pollutants; 2) set compliance deadlines for owners/operators of treatment facilities in violation of federal regulations; 3) prescribe surface water treatment, promulgate lead, disinfection and other action mandates, and 4) strengthen the enforcement of all regulations in the initial Act.

Chemical, physical, radiological, and bacteriological substances in drinking water, which pose a health risk to the public, are regulated by the EPA under provisions given in the SDWA. The EPA has established an extensive list of maximum contaminant levels (MCLs) for most common inorganic contaminants, as well as an evolving list of organic contaminants. The Act dictates a strict schedule to determine reasonable MCLs for newly listed additional contaminants. Contaminants are added to the list on a regular basis by the EPA and are subject to new regulations.

To control and improve the aesthetic quality of drinking water supplies, the SDWA also includes a list of secondary maximum contamination levels (SMCLs) for water aesthetics such as taste, odor, and color. The measurement of SMCLs has allowed for a reasonable level of standardization in water aesthetics from one supply to another.

The SDWA also requires state and local water agencies to monitor a specified list of both regulated and unregulated contaminants. The selection of contaminants is dependent upon the number of people served, the water supply source, and the contaminants likely to be found. The standardized monitoring framework is administered over three, 3-year compliance cycles for a nine-year total monitoring period beginning in 1992. The completion of the first nine-year monitoring period will be followed by a second nine-year period.

New capacity development provisions are also a component of the SDWA amendments. EPA must now complete a review of existing state capacity development efforts and publish information to assist the states and public water suppliers with these efforts. Capacity development studies in Utah will include feasibility discussions on consolidation of myriad small water systems into fewer numbers of larger water systems in each county.

By August 6, 1998, EPA was to have published regulations that would require community water systems to prepare and distribute consumer confidence reports at least once per year. The governor of a state may elect to not apply the direct mailing requirement to any community water system that serves fewer than 10,000 people.

The SDWA requires the EPA to publish a maximum contaminant level goal (MCLG) and promulgate a National Primary Drinking Water Regulation (NPDWR) for contaminants that: (1) may have an adverse effect on human health, (2) are known, or are likely, to occur in public water systems at a frequency and concentration of significance to public health, and (3) whose regulation offers a meaningful opportunity to reduce health risk for people served by public water systems.

EPA must issue regulations that establish criteria for a monitoring program for unregulated contaminants. The regulations are required to utilize only a representative sample of systems serving 10,000 or fewer people. By August 6, 1999, and every five years thereafter, EPA must issue a list of no more than 30 unregulated contaminants to be monitored by public water systems and to be included in the occurrence database.

The SDWA Amendments also authorize EPA to provide grants to states for the development and implementation of state programs to ensure the coordinated and comprehensive protection of groundwater resources within each state.

11.4 CULINARY WATER USE AND PROJECTED DEMAND

In 1977, the state of Utah began a cooperative effort with the U.S. Geological Survey to quantify water use for public water suppliers and major self-supplied industries. The data are collected by the Division of Water Rights through questionnaires mailed each year to public water suppliers. The data for 1979 through 1993 are summarized in published reports and on the Internet. The 1994 through 1995 data have not yet been published.

Table 11-4 lists the major retail water providers along with existing water use data (1995) and the projected water demand (2020) for the basin. These projections are based upon existing per capita water use and population projections (see Table 4-1). These community water systems have an existing water supply of 25,870 acre-feet. The total culinary water use for these systems was 7,080 acre-feet in 1995. Their collective projected water demand for 2020 is 15,482 acre-feet.

Table 11-4
CURRENT AND PROJECTED CULINARY WATER DEMAND BY COMMUNITY WATER SYSTEM
West Desert Basin
(acre-feet/yr)

Water Supplier	Existing Supply	Current System Capacity	Current Water Use	Projected Water Demand* (2020)
Box Elder County				
Grouse Creek	180	80	33	40
Howell Town Water Dept.	290	130	42	130
Snowville Waterworks Inc.	500	210	159	120
County Totals	970	420	234	290
Tooele County				
Dugway - English Village	3,360	1,390	793	500
Erda Acres Water Company	850	380	53	850
Golden Gardens	100	50	22	80
Grantsville Municipal Water	3,710	1,640	1,162	2,680
Lincoln Culinary Water	140	80	79	140
Ophir Canyon Water Assoc.	110	50	32	50
S and W Trailer Park	30	20	16	30
Silver Spurs Ranchos	30	20	10	20
Stansbury Park Imp. Dist.	4,240	1,840	589	1,940
Stockton Municipal Water	500	260	260	220
Tooele Municipal Water	7,830	3,240	3,244	8,000
Vernon Water Works	110	60	64	140
Wendover Municipal Water	3,550	1,530	476	482
County Totals	24,560	10,560	6,800	15,132
Juab County				
Goshute Indian Reservation	20	20	13	30
Millard County				
Eskdale	320	140	33	30
	25,870	11,140	7,080	15,482

*Calculated demand for 2020 is based upon the CWS's current water use.

11.5 DRINKING WATER PROBLEMS

11.5.1 Future Growth

For much of the basin, growth does not loom as a serious problem. This is particularly true for the small rural communities where growth in recent years has been slight to non-existent. For many of these areas, even a doubling of the population would not represent a significant increase in the number of people. In Tooele Valley and Wendover, however, relatively high growth rates are expected. Fortunately, the county and city planners in these areas have already addressed the issue. Wendover, Utah, and West Wendover, Nevada, have addressed the issue jointly and have developed well and spring sources sufficient to supply their culinary water needs through 2020. Tooele County has addressed the issue of growth in its Tooele County General Plan, November 1995, which projects adequate water supplies through the year 2020. The city of Tooele will be the most significantly impacted community, with its population projected to double by the year 2020. For some time, city planners were concerned about their ability to meet the water needs of such growth. But the recent addition of three successful new wells along with the purchase of existing water rights have dramatically improved Tooele city's water supply for the present and immediate future. As the year 2020 approaches however, Tooele city's population will again approach the limits of the city's water supply if additional water sources are not obtained. Table 11-4 compares existing water supplies of the basin's community water systems with the current use and the projected demand for the year 2020. The data show nearly every community water system has adequate supplies to meet future needs through 2020. The exceptions in Tooele County are Lincoln Culinary Water and Erda Acres Water Company. Outside of Tooele County, the only community with an inadequate supply for their 2020 population projection is the Goshute Indian Reservation.

11.5.2 Repairing, Upgrading, and Expanding Facilities

Occasional repair, replacement, enlargement, or upgrading of water systems is necessary to maintain satisfactory levels of service. The improvements may cover a wide range of facilities but generally address well or spring source needs and storage tank or pipeline infrastructure needs. Some communities have occasionally paid for these improvements without outside help, but most have made use of public funding programs. Specific funding programs are identified in Tables 8-3 and 8-4.

11.5.3 Groundwater Contamination

Since groundwater makes up a significant part of the culinary water supply in the basin, the prevention of groundwater contamination must be a major focus. Groundwater contamination can go undetected until it becomes widespread and very expensive to mitigate. Even after detection, such contamination can be extremely difficult to quantify and contain.

Basin-wide, as a general rule, groundwater quality has not changed significantly in recent years. However, wells drilled in recent years in the south-central and southeastern portions of the Tooele Valley have experienced poorer water quality than similar wells had previously experienced. Selected wells should be monitored to observe if poor quality groundwater is moving into areas of good quality groundwater. Monitoring wells should also be used to observe the effects of mine discharge on ground water quality.

11.5.4 New Requirements

One problem faced by culinary water providers is the ever-tightening water quality standards and regulations. Today's water quality standards are more stringent than those of 20 years ago. It is likely standards will be even more demanding in years to come. Several impending changes have already been mentioned in subsection 11.3. Changing standards and tougher regulations reflect society's growing awareness of the effects of pollution and the desire to better protect the public from environmental contaminants.

Tightened standards are not without cost. Requirements to comply with higher water quality standards generally result in higher water treatment costs. Sometimes compliance with new standards can be achieved with procedural changes and only minimal cost increases. Often, however, higher water quality standards necessitate expensive infrastructural changes. At the present time there are no water treatment facilities in the basin, since all of the basin's culinary water supplies come from spring and well sources. If changing standards necessitate the treatment of well and spring water sources then the basin's water providers will be faced with a significant problem. Complying with water quality standards can be troublesome enough for large metropolitan water providers, but it can be an economic impossibility for the very small communities that exist in the West Desert Basin.

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Section 12

West Desert Basin

Utah State Water Plan

Water Quality

12.1 INTRODUCTION

This section presents data and information on existing levels of water quality in the West Desert Basin. Sources of pollution are identified, problems and solutions are discussed, and recommendations for control and improvement by responsible agencies are given. Water pollution comes from both natural and man-caused sources. Examples of naturally occurring pollution include such things as mineral springs, erosion, landslides, wildlife waste materials, and dead and decaying animals. Man-caused pollution is categorized as being from either point or non-point sources. Point sources contribute pollution from a single definable point such as a pipe discharge from an industrial plant or municipal wastewater treatment facility. Non-point pollution comes from diffuse sources via overland flow and gully erosion. This includes pollution from activities such as agriculture, grazing, mining, construction, urban runoff, and recreation.

12.2 SETTING

There are 12 wastewater treatment plants (WWTP) in the basin. These are shown in Table 12-1. Tooele City's new Wastewater Reclamation System went into operation in April 2000 and is the first of its kind in Utah. The Treatment plant is located adjacent the Overlake golf course and the system's effluent is used in the golf course's water features and to irrigate the course. At the present time the plant is processing 1.4 million gallons of wastewater per day. The system is designed to handle 2.35 million gallons per day with the capability of expanding to 4.7 million gallons per day. Treated municipal wastewater has been has been used to irrigate cropland for years, but this is the first time in Utah that reclaimed municipal water has been reused in a residential setting. The reclaimed water is used not only to maintain fairways and greens but is also available for lawns in the Overlake community.

Water quality is very important and often easily degraded. While natural environmental processes provide a means for removing pollutants from water, there are definite limits. It is up to society to provide safeguards to protect and maintain water quality.

Tooele Wastewater Reclamation Plant

Table 12-1 **MUNICIPAL AND INDUSTRIAL WASTEWATER TREATMENT FACILITIES**			
Treatment Facility	Type of Treatment	Receiving Stream	Discharge (mgd)
Box Elder County			
Thiokol Wastewater Treatment Plant	Oxidation	Blue Creek	.23
Tooele County			
Grantsville Wastewater Treatment Plant	Aerated Lagoon	Blue Lake	.74
Lake Point Wastewater Treatment Plant	Total Containment	N.A.	N.A.
Stansbury Park Wastewater Treatment Plant	Total Containment	N.A.	N.A.
Tooele Wastewater Reclamation System	Trickling Filter	Irr. ditch	1.4
Tooele Army Depot Wastewater Treatment	Total Containment	N.A.	N.A.
Wendover Wastewater Treatment Plant*	Facultative Lagoon/ Total Containment	N.A.	N.A.
Barrick-Mercur Mine	Total Containment	N.A.	N.A.
Dugway - Baker	Total Containment	N.A.	N.A.
Dugway - Carr	Total Containment	N.A.	N.A.
Dugway - Ditto	Total Containment	N.A.	N.A.
Dugway English Village	Total Containment	N.A.	N.A.
* 20% goes to West Wendover Treatment Plant where the effluent is used on the golf course			

12.3 ORGANIZATIONS AND REGULATIONS

Passage of the Utah Water Pollution Control Act of 1953 ushered the state into maintaining high quality water resources. The Federal Water Pollution Control Act in 1972 brought about major changes, particularly in the wastewater treatment program. The Safe Drinking Water Act of 1976 requires individual water systems to collect data on various bacteriological parameters, inorganic chemicals, and organic chemicals that may be a hazard to public health.

A number of federal, state and local agencies are currently involved in the management and monitoring of water quality. These agencies include: the Utah Department of Agriculture and Food, the Utah Department of Environmental Quality (Division of Water Quality, and Division of Drinking Water), the U.S. Bureau of Reclamation, the U.S. Geological Survey, and the U.S. Environmental Protection Agency.

12.3.1 Local

Towns, cities and counties have primary responsibilities for water pollution control within their respective entities. These responsibilities and authorities are contained in Titles 10, 11, 17, 19 and 73 of the *Utah Code Annotated*, 1953, amended.

12.3.2 State

The state agency charged with the responsibility to regulate water quality is the Utah Division of Water Quality within the Utah Department of Environmental Quality. Historically, water quality has been under jurisdiction separate from water quantity and the Division of Water Rights. Changing conditions will impact this relationship. Increasing populations will require more high quality water.

There will also be more water quality problems associated with increased urban growth and recreational activities. These conditions will require those concerned with water quality to work closely with administrators of water rights. Eventually, close coordination will be required as one issue will directly influence the other.

State programs are not comprehensive enough to cover all activities which can be sources of groundwater contamination. The number of these activities suggests it will be difficult in the future to maintain the high quality of groundwater unless local governmental agencies take an active role in protecting wells, springs and the groundwater aquifer. This issue is discussed in more detail in Section 11 - "Drinking Water" and Section 19 - "Groundwater."

Utah Department of Agriculture and Food - The Environmental Quality Section of the Department of Agriculture manages Utah's agricultural non-point source water pollution control and prevention program via contract from the Department of Environmental Quality (DEQ). This is partially funded through federal grants passed through DEQ from the Environmental Protection Agency (EPA) and partially supported by matching funds from state and local government agencies and private sources. The program is divided into several parts: watershed management projects, usually on-the-ground conservation efforts; groundwater monitoring, which is a combination of education and monitoring; and information and education, a combination of school and adult education and public information, including newsletters, brochures, videos and slide shows.

Department of Environmental Quality - The Department of Environmental Quality has implemented the Groundwater Quality Protection Strategy for the state of Utah based on an Executive Order issued in 1984 by the governor of Utah.

Under the Utah Water Quality Act, the Division of Water Quality is responsible for establishing water quality standards and regulating impacts to the waters of the state. Additionally, the Environmental Protection Agency has delegated authority to Utah to administer its federal-based water quality regulatory programs. Facilities that produce, treat, dispose of or otherwise discharge wastewater may need permits from the Division of Water Quality.

Storm water discharge permits are required from most industries and some municipalities that discharge storm water runoff to surface waters such as lakes or streams. Storm water pollution prevention plans must be in place prior to application. Any facility that discharges, or may discharge, pollutants to groundwater is required to obtain a Ground Water Discharge permit. Major agricultural, municipal and industrial dischargers are regulated.

Wastewater discharge to surface waters, including storm drains, requires a permit prior to such discharge. Utah Pollutant Discharge Elimination System (UPDES) permits are required for all industrial, municipal and federal facilities. Any facility discharging wastewater may need a UPDES permit unless it discharges into a municipal sanitary sewer system.

The Division of Water Quality has established surface stream classifications in Utah based on existing uses. Table 12-2 gives the classification for the basin's streams. Different reaches of the same stream can fall under different classifications.

12.3.3 Federal

To date, the role of the federal government has been to set national policy by passing laws such as the Safe Drinking Water Act and the Clean Water Act. The federal government's present approach is to allow states considerable leeway in enforcing and complying with these statutes. However, should states and local governments fail to act decisively to comply with

Table 12-2

SURFACE WATER CLASSIFICATIONS

Streams	Classification					
Grouse Creek and tributaries, Box Elder County		2B			3C	4
Muddy Creek and tributaries, Box Elder County		2B			3C	4
Dove Creek and tributaries, Box Elder County		2B			3C	4
Pine Creek and tributaries, Box Elder County		2B	3A			4
Rock Creek and tributaries, Box Elder County		2B	3A			4
Fisher Creek and tributaries, Box Elder County		2B	3A			4
Dunn Creek and tributaries, Box Elder County		2B	3A			4
Donner Creek and tributaries, Box Elder County		2B	3A			4
Betteridge Creek and tributaries, Box Elder County		2B	3A			4
Indian Creek and tributaries, Box Elder County		2B	3A			4
Tenmile Creek and tributaries, Box Elder County		2B	3A			4
Curlew Creek, Box Elder County		2B	3A			4
Blue Creek and tributaries, from GSL to Blue Creek Reservoir		2B			3D	4
Blue Creek and tributaries, from Blue Creek Reservoir to headwaters		2B		3B		4
All perennial streams on the east slope of the Pilot Mountain Range		2B	3A			4
North Willow Creek and tributaries, Tooele County	1C	2B	3A			4
South Willow Creek and tributaries, Tooele County		2B	3A			4
Hickman Creek and tributaries, Tooele County		2B	3A			4
Barlow Creek and tributaries, Tooele County		2B	3A			4
Clover Creek and tributaries, Tooele County		2B	3A			4
Faust Creek and tributaries, Tooele County		2B	3A			4
Vernon Creek and tributaries, Tooele County		2B	3A			4
Ophir Creek and tributaries, Tooele County		2B	3A			4
Settlement Canyon Creek and tributaries, Tooele County		2B	3A			4
Middle Canyon Creek and tributaries, Tooele County		2B	3A			4
Tank Wash and tributaries, Tooele County		2B	3A			4
Basin Creek and tributaries, Tooele and Juab Counties		2B	3A			4
Thomas Creek an tributaries, Juab County		2B	3A			4
Indian Farm Creek and tributaries, Juab County		2B	3A			4
Cottonwood Creek and tributaries, Juab County		2B	3A			4
Red Cedar Creek and tributaries, Juab County		2B	3A			4
Granite Creek and tributaries, Juab County		2B				4
Trout Creek and tributaries, Juab County		2B				4
Birch Creek and tributaries, Juab County		2B				4
Deep Creek and tributaries, Juab County and Tooele Counties		2B	3A			4
Cold Spring, Juab County		2B		3C	3D	
Cane Spring, Juab County		2B		3C	3D	
Lake Creek, from Garrison (Pruess Reservoir) to Nevada state line		2B	3A			4
Snake Creek and tributaries, Millard County		2B		3B		4
Salt Marsh Spring Complex, Millard County		2B	3A			
Twin Springs, Millard County		2B		3B		
Tule Spring, Millard County		2B		3C	3D	
Coyote Spring Complex, Millard County		2B		3C	3D	
Hamblin Valley Wash and tributaries, Nevada state line to headwaters		2B			3D	4

Class 1	Culinary raw water source
Class 1C	Domestic use with prior treatment
Class 2	Instream recreational use and aesthetics
Class 2A	Primary human contact: swimming
Class 2B	Secondary human contact: boating, wading, etc
Class 3	Instream use by aquatic wildlife
Class 3A	Habitat maintenance for cold water game fish, water-related wildlife and food chain organisms
Class 3B	Habitat maintenance for warm water game fish, water-related wildlife and food chain organisms
Class 3C	Habitat for non game, water-related wildlife and food chain organisms.
Class 3D	Habitat for water fowl, shore birds, water-related wildlife, and food chain organisms.
Class 4	Agricultural-livestock and irrigation water.
Class 5	Great Salt Lake general use: primary and secondary human contact, water related wildlife, and mineral extraction
Class 6	General use restricted and/or governed by environmental and health standards and limitations

the laws, the federal government may assert a more active role in the enforcement of federal water quality standards.

The federal government has also been involved in funding numerous water quality projects through the Superfund Cleanup Program. The primary agencies involved in water quality issues are: the U.S. Bureau of Reclamation, the U.S. Geological Survey, the Natural Resources Conservation Service and the Environmental Protection Agency.

Federal standards for solid waste and hazardous material are set forth under the Comprehensive Environmental Response and Comprehensive Liability Act (CERCLA). These standards are regulated by the Environmental Protection Agency. Compliance is verified through the local agencies:

Bureau of Reclamation - The bureau's water quality objective is to collect baseline data to be used in assessing the impact of potential projects on the water quality of streams.

U.S. Geological Survey - The U.S. Geological Survey (USGS) has an established database on surface and groundwater quality in the basin. Although the major emphasis of the USGS program is flow measurement, some stations are routinely monitored for water quality. The USGS data can be accessed through either the EPA STORET system or the USGS WATSTORE system. Table 12-3 lists the discontinued surface water quality stations for which the U.S. Geological Survey has water quality data. Table 12-4 gives surface water quality of selected streams in the basin.

Environmental Protection Agency - The Environmental Protection Agency not only has responsibility to monitor compliance with the federal Clean Water Act, but also oversees the national Superfund Cleanup Project projects.

12.4 WATER QUALITY PROBLEMS AND NEEDS

Water quality can be impaired either by man or by natural causes. The West Desert Basin is free of any really significant water quality problems. Surface water streams arise in the mountains and remain relatively free of natural and man caused pollution to the point at which they are diverted for agricultural use. Groundwater tends to be high in TDS near the Great Salt Lake, but near the mountain benches where there is significant recharge, groundwater quality is generally good to excellent.

12.4.1 Surface Water

Irrigation water is typically diverted from mountain streams at or above the mouth of the canyon. The quality of water from these streams is generally high. The one exception is Deep Creek (Curlew Valley) which flows into Utah from Idaho. The water quality of this stream is low because much of the flow is return flow from agricultural use. The basin's stream channels below the points of diversion are often dewatered or can have a high salinity problem. Some riparian areas have been degraded but there is not a lot of man-caused water quality impacts within the basin.

12.4.2 Groundwater Pollution

Groundwater is one of the state's most valuable resources. In the West Desert Basin, groundwater accounts for virtually 100 percent of the municipal and industrial water supply. Magnifying the issue of groundwater quality is the concern with how easily an aquifer can be polluted and how difficult it can be to clean up. Additionally, groundwater contamination is not readily apparent or easily detected. Groundwater issues are discussed in detail in Section 19 of this report.

Table 12-3
DISCONTINUED SURFACE WATER QUALITY STATIONS
West Desert Basin

Number	Description	Years of record
172903	Great Salt Lake West Pond near Wendover	1988-90
172963	West Locomotive at Locomotive Spring near Snowville	1973-75
172964	Baker Spring at Locomotive Spring near Snowville	1969-70 & 1973-75
172965	Bar M Spring near Snowville	1969-70 & 1973-80
172967	Off Spring at Locomotive Spring near Snowville	1969-70 & 1973-80
172968	Sparks Spring at Locomotive Spring near Snowville	1969-70 & 1973-80

TABLE 12-4
SURFACE WATER QUALITY OF SELECTED STREAMS
West Desert Basin

Stream Gage Number - Name	Electro Conductivity (µmhos/cm @ 25°C)			Total Dissolved Solids (mg/l)			No. of Samples
	Max.	Min.	Ave.	Max.	Min.	Ave.	EC/TDS
10172700 - Vernon Creek near Vernon, Utah	650	140	424				158/
10172765 - Clover Creek above Big Hollow near Clover, Utah	350	290	323				15/
10172791 - Settlement Canyon above reservoir near Tooele, Utah	565	460	490				16/
10172795 - Box Elder Wash near Grantsville, Utah	560	455	509				6/
10172800 - South Willow Creek near Grantsville, Utah	430	160	260				131/
10172805 - North Willow Creek near Grantsville, Utah	350	0	244				58/
10172870 - Trout Creek near Callao, Utah	700	44	115				153/
10172952 - Dunn Creek near Park Valley, Utah	400	95	222				62/
10172963 - West Locomotive Spring at near Snowville, Utah	4230	4230	4230	2610	2610	2610	1/1
10172964 - Baker Spring at Locomotive Spring near Snowville, Utah	3250	3250	3250	1920	1920	1920	1/1
10172965 - Bar M Spring at Locomotive Spring near Snowville, Utah	5990	4870	5637	3290	2950	3100	34/22
10172967 - Off Spring at Locomotive Spring near Snowville, Utah	6300	5200	5854	3400	3090	3253	33/22
10172993 - Blue Spring Creek at Promontory Road	10500	8330	9552	6560	5140	5613	3/2
13077659 - Raft River near Yost, Utah	764	512	621				7/
13077690 - Johnson Creek near Yost, Utah	300	300	300				1/
13077700 - George Creek near Yost, Utah	410	60	138	191	63	70	85/6
13077710 - George Creek at Yost, Utah	235	235	235	146	146	146	1/1
13079000 - Clear Creek near Naf, Idaho	234	100	124	134	68	75	6/5
13078100 - Onemile Creek near Standrod, Idaho	270	270	270				1/

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Section 13

West Desert Basin

Utah State Water Plan

Disaster and Emergency Response

13.1 INTRODUCTION

This section discusses flood hazard mitigation and drought response. It also briefly discusses programs now in place and additional programs that could be beneficial in dealing with flooding and drought problems. The Division of Comprehensive Emergency Management (CEM) is responsible for disaster and emergency response at the state level. Many types of emergency situations are water-related, varying from disastrous flooding to extreme drought. Most disasters are naturally caused. A few, such as chemical or oil spills, are human-caused. Some situations, such as a dam failure, can have a complex combination of both natural and human-related causes.

When any emergency situation arises, a prearranged response plan, provides a quick and effective coordinated response. Generally, the response plan should emphasize orderly response to emergency situations. The state maintains a hazard mitigation team to provide coordination with local governmental authorities to establish measures to lessen or eliminate the impact of a disaster. This team represents state agencies in hazard mitigation matters. The following paragraphs define the organizational responsibilities for emergency response in the West Desert Basin, concentrating mainly on the two most common water-related emergencies of floods and drought.

13.2 BACKGROUND

The history of water-related natural disasters in the West Desert Basin includes few significant floods or drought events. The sparse population has not encroached upon the natural waterways or taxed existing water supplies to the point that flooding or droughts have become a reoccurring problem. The floods of the mid-1980s, however, resulted in millions of dollars in property damage to businesses, public utilities and infrastructure. But these flooding problems were primarily associated with the rising level of the Great Salt Lake and the impact upon the lake's surrounding industries, roadways and railroad. Local flooding throughout the basin during that period was primarily associated with an elevated groundwater table and an increase in artesian pressure. The extended drought years of the late 1980s lowered reservoir storage levels significantly, and in some instances prompted consideration of restrictions for outdoor water use. But for the most part, the basin does not have as great a threat of flooding or drought as is found in much of the rest of the state. In spite of this basin's diminished likelihood for natural disasters the various counties of the basin currently have an existing policy to preserve rights-of-way over existing natural drainage ways to ensure that flood plains remain free of development.

> Reacting to a disaster or emergency after it has already occurred is not as efficient as pre-disaster activities, such as floodplain management, hazard mitigation and planning.

The northern Utah region is considered a high seismic risk area. There are many potentially active faults. The 1934 Hansel Valley earthquake was one of Utah's largest, and is the only historically documented earthquake in Utah known to have produced ground rupture along the causative fault. Although we are unable to accurately predict earthquake activity, a study of the frequency of quakes for this region suggests a rather large seismic event (up to 7.0 on the Richter Scale) could be expected in the future. Recent studies of earthquake preparedness have shown local building codes inadequately address the potential for ground-shaking, and predict extensive property damage and loss of life in a "major" event. The basin's high hazard dams, however, have been designed against the probable maximum earthquake although both Blue Creek and Settlement Canyon dams have minor deficiencies that will be addressed and rectified under the minimum standards program. Dams designed for the maximum probable earthquake are expected to maintain their integrity despite sustaining some damage in such an event. It is likely that in the event of a major earthquake, there will be some localized flooding due to ruptured canals, aqueducts and impoundments.

Settlement Canyon Reservoir

13.3 ORGANIZATIONS AND REGULATIONS

13.3.1 Local

As a result of flooding in 1952, the Utah Legislature passed a law giving counties the responsibility for flood control operations. This responsibility was expanded in 1961 with the ability to levy taxes for flood control operations, to bond for capital flood control improvements and to establish special flood control districts. Each county's public works department has rights-of-way or clear title over most of the major streams within the county. Local cities and towns are responsible for planning and controlling runoff within city limits and outside of the county flood control's right-of-way. Their efforts, however, must comply with the county's flood control criteria. The county agencies responsible for disaster response and disaster preparedness are listed in Table 13-1.

13.3.2 State

The Division of Comprehensive Emergency Management (CEM) of the Department of Public Safety is responsible for developing emergency response and management plans. Under the direction of CEM, towns, cities and counties prepare emergency response and management plans that are comprehensive in scope but allow for effective and close cooperation with state and federal agencies in the event of a major disaster beyond local capabilities. CEM also works closely with other state and federal agencies to assure needed manpower, equipment, materials and supplies reach the disaster areas.

The initial response to a natural disaster is the responsibility of the impacted city or county. Other agencies involved after the initial response and in the long-term management of a natural disaster have the responsibility to work within established procedural guidelines and organizational structures. These guidelines have

Table 13-1 DISASTER RESPONSE RESPONSIBILITY			
County	Responsible Position	Phone Number	Office Location
Box Elder	Director, Box Elder County Emergency Services	(435) 734-2031	Brigham City
Tooele	Director, Tooele County Emergency Services	(435) 882-9260	Tooele
Juab	Director, Juab County Emergency Services	(435) 623-1349	Nephi
Millard	Director, Millard County Emergency Services	(435) 743-5302	Fillmore
Beaver	Director, Beaver County Emergency Services	(435) 438-2862	Beaver
Iron	Director, Iron County Civil Defense	(435) 586-6511	Cedar City

been developed to assure needed help and assistance is rendered in a timely and effective manner. Other agencies and officials involved in emergency response include the Governor's Office and the heads of all state divisions and departments.

13.3.3 Federal

The federal government provides assistance in disaster response, recovery, preparedness and mitigation through the Federal Emergency Management Agency (FEMA). Following a natural disaster, FEMA assistance commences with a Presidential Declaration of Disaster. The presidential disaster declaration generally follows a request from the governor for federal assistance. A federal disaster declaration provides the state with financial assistance from the federal government, along with FEMA personnel experienced in handling various aspects of disaster response, recovery and mitigation. The Federal Response Plan (FRP) is set up to provide technical assistance in the following twelve emergency support functions: transportation, communications, public works and engineering, fire fighting, damage information, mass care, resources, health and medical services, urban search and rescue, hazardous materials, food and energy. One of the overriding principles in the FRP is state and local leadership remain in charge while FEMA personnel fulfill a supporting role.

13.4 FLOODING PROBLEMS

There is no single entity with sole authority for flood control management activities. Cities and counties have the necessary statutory authority to act, but at least six other state and federal agencies also have some degree of authority and responsibility. The state's emergency response and hazard mitigation coordination authority rests with CEM. Hazard mitigation planning is usually provided by the state hazard mitigation team following flood emergencies. Pre-emergency planning is also often conducted. CEM assists the counties in maintaining their preparedness plans.

Thunderstorms are common during the summer and fall months and produce localized cloudburst flooding. Although the total volume of water produced by these storms is comparatively small, the instantaneous and localized runoff rate can be high. Damage from thunderstorms most often takes the form of erosion and sediment transport and deposition. There can also be significant landslides and mud-flows resulting from these storms. Typically, these events occur along the hillsides or at the canyon mouths and adjacent residential developments.

13.5 DROUGHT PROBLEMS

Much of the West Desert Basin has an agricultural based economy. Even the basin's urban/suburban areas still rely heavily upon local agricultural for economic stability. With relatively few reservoirs the basin is dependent upon annual precipitation for its water supplies. There is little water storage from year to year. Consequently even one drought can have a serious impact upon the local economy. Although the agricultural community usually has the most senior water rights, in periods of extreme drought, when all users are required to cut back on water consumption, the farmer can suffer significant financial losses including total crop failure. Another water use significantly impacted by drought is the wildlife and waterfowl management areas. These water users are located at river's end and have come to rely heavily upon return flows as well as natural stream flows. Water shortages can result in disease and death for significant numbers of waterfowl and wildlife.

13.6 OTHER WATER-RELATED EMERGENCY PROBLEMS

There are other disasters where water supplies can be impacted. Generally these are more localized in nature than flooding and drought. Included are such things as structural failure of water supply facilities (i.e. dams and aqueducts), toxic spills, landslides and earthquakes.

13.6.1 Toxic Spills

Toxic spills could occur along major highways such as I-80 and I-84, or along one of several railroad lines. But with several remotely located military testing and proving grounds as well as a weapon disposal facility located in Tooele Valley, a toxic spill could occur almost any where in the basin. One of the greatest threats imposed by a toxic spill is localized groundwater contamination. Groundwater contamination can be hard to detect, hard to quantify and difficult to clean up. For more on this subject see Groundwater, Section 19.

13.6.2 Earthquakes

Except for the Promontory Mountains, Blue Creek Valley and Hansel Valley, the West Desert Basin lies almost entirely outside of the Intermountian Seismic Belt. In recent years there has been considerable earthquake activity in and around Hansel Valley and Blue Creek Valley, and even some small earthquakes recorded at Lakeside, west of the Great Salt Lake. The rest of the basin has experienced little earthquake activity and virtually nothing above the 3.0 range on the Richter scale. Still there are faults present throughout the basin and there is potential for a large earthquake to occur. Additionally the soft sediments that make up the valley floors throughout the basin will easily convey and even magnify the ground movement associated with an earthquake over large distances. Consequently a large earthquake could cause structural damage to dams, water pipes, and water storage tanks which in turn could result in flooding problems and/or water shortages. Earthquake activity can also alter the yields from wells and springs. The largest historic earthquakes have been along the Utah-Idaho border: the 1909 Hansel Valley earthquake, est. magnitude 6.7, which generated waves on the Great Salt Lake; the 1934 Hansel Valley earthquake, magnitude 6.7, Utah's only earthquake known to have been accompanied by ground rupture; and the 1975 Pocatello Valley earthquake, magnitude 5.7.

The only reservoirs in the basin that represent a threat to human life and have therefore been given high hazard ratings are Settlement Canyon, Grantsville and Blue Creek Reservoirs. Of these three, only Blue Creek Reservoir is located in the area that most frequently experiences earthquakes. Settlement Canyon Reservoir, however, is located on the west slope of the Oquirrh Mountains, and although the Oquirrhs have not experienced a lot of earthquakes there have been a few.

Blue Creek Reservoir

13.6.3 Landslides

Landslides are most likely to occur along the foothills of the basin's mountain ranges or up one of the many canyons. Landslides can cover streams and/or canals resulting in immediate flooding to areas upstream of the slide. Following such an event there is also the threat that impounded water will overtop and wash out the slide material, resulting in severe flooding to areas immediately downstream. Due to the basin's sparse population, landslides do not pose a serious threat for much of the basin. In Tooele and Rush valleys, however, several small towns are situated on the mountain benches and at canyon mouths and could be susceptible to the hazard of landslides.

13.7 FLOOD PREVENTION AND HAZARD MITIGATION

Flood hazard mitigation includes both structural and non-structural activities that either eliminate or greatly reduce the impacts of flooding. Examples of structural mitigation measures include debris basins, dams, levees, various types of control structures, and pipelines. Examples of non-structural mitigation activities are flood forecasting, zoning, flood plain protection and flood insurance. To be effective, flood hazard mitigation activities should be completed prior to the occurrence of a disaster. Flood hazard mitigation can also be thought of as a post event activity. Managing agencies should use the lessons learned from recent events to prepare for and mitigate against possible recurrence.

13.7.1 Forecasting

Peak surface water flows occur in the spring of the year and are primarily a function of snowmelt and runoff. These events can be forecasted with a fair degree of accuracy by monitoring the snow survey data. Forecasts can, in turn, be used to initiate flood preparations such as sandbagging. This process of forecasting and pre-flood preparations worked well to mitigate a great deal of potential flood damage in 1984 and 1986.

13.7.2 Flood Plain Zoning and Flood Insurance

One of the most effective methods of mitigating or minimizing the effects of future flooding is through creation and strict adherence to a flood plain zoning plan. County and city governments should work through the state Community Assistance Program of the National Flood Insurance Program to evaluate flood hazard maps of identified flood plains, and enact appropriate zoning regulations to minimize urban encroachment and thereby reduce the potential for flood damages. Most communities already have current maps and ordinances. In addition, areas where national flood insurance can be made available by the adoption of associated flood plain standards, local governments should attempt to do so. Public education and promotion of flood awareness would also be beneficial.

Counties and the various communities should be aggressive in regulating and limiting the construction of inappropriate and expensive development within the flood plains. Experiences nationwide have shown that when residential and commercial development takes place in the floodplain, catastrophic flooding leads to serious injuries, loss of life and significant economic impacts. The development of parks, golf courses, wetlands, wildlife preserves and other uses within the flood plain can, however, be a beneficial use of those lands.

As a protection against monetary losses when flooding occurs, the National Flood Insurance

Program is effective in areas where it is available. The Federal Emergency Management Agency (FEMA) has identified special hazard areas with flood insurance rate maps. Zoning and flood hazard reduction regulations have been adopted by these communities to direct future construction should occur to minimize flood damage. A key benefit from local adoption of the floodplain standards has been the availability of flood insurance through private companies at reduced rates.

Flood plain maps have been prepared by FEMA for Tooele (Figure 13-1), Wendover (Figure 13-2) and Stockton (Figure 13-3). The FEMA flood plain boundaries shown are approximate and those living outside the boundaries should not assume they are without risk from flooding. There are communities that do not participate in the National Flood Insurance Program, some because they are outside the flood plains.

13.7.3 Watershed Protection

Prevention and mitigation are usually more cost-effective than damage repair and recovery after a disaster event. Flooding can be significantly reduced by maintaining and protecting watershed vegetation and/or by building watershed flood storage. When requested by landowner, the Natural Resources Conservation Service reviews the potential for small watershed projects in the basin.

Wildfires during dry summer months can significantly damage vegetation and greatly increase the potential for high runoff and debris flows. The occurrence of wildfire disasters should be quickly followed by efforts to mitigate against the increased flooding potential and increased erosion potential. Revegetation is often called for, but with intense burns near developed areas more immediate solutions may be necessary such as grading, or the construction of a debris flow basin, or some other erosion controlling measure.

13.7.4 Flood Control Structures

Flooding has not been a major issue in the West Desert Basin, however, localized flooding has occasionally been a problem. In areas of rapid growth and development such as in Tooele County, surface water drainage has become a big concern. Where flooding or debris flows are a reoccurring problem, flood control structures, flood basins, debris basins, dams, levees, various types of control structures and pipelines can be built to retain and attenuate flood flows or contain debris flows. Examples of these can be found in the Hansel Valley and the Blue Creek areas.

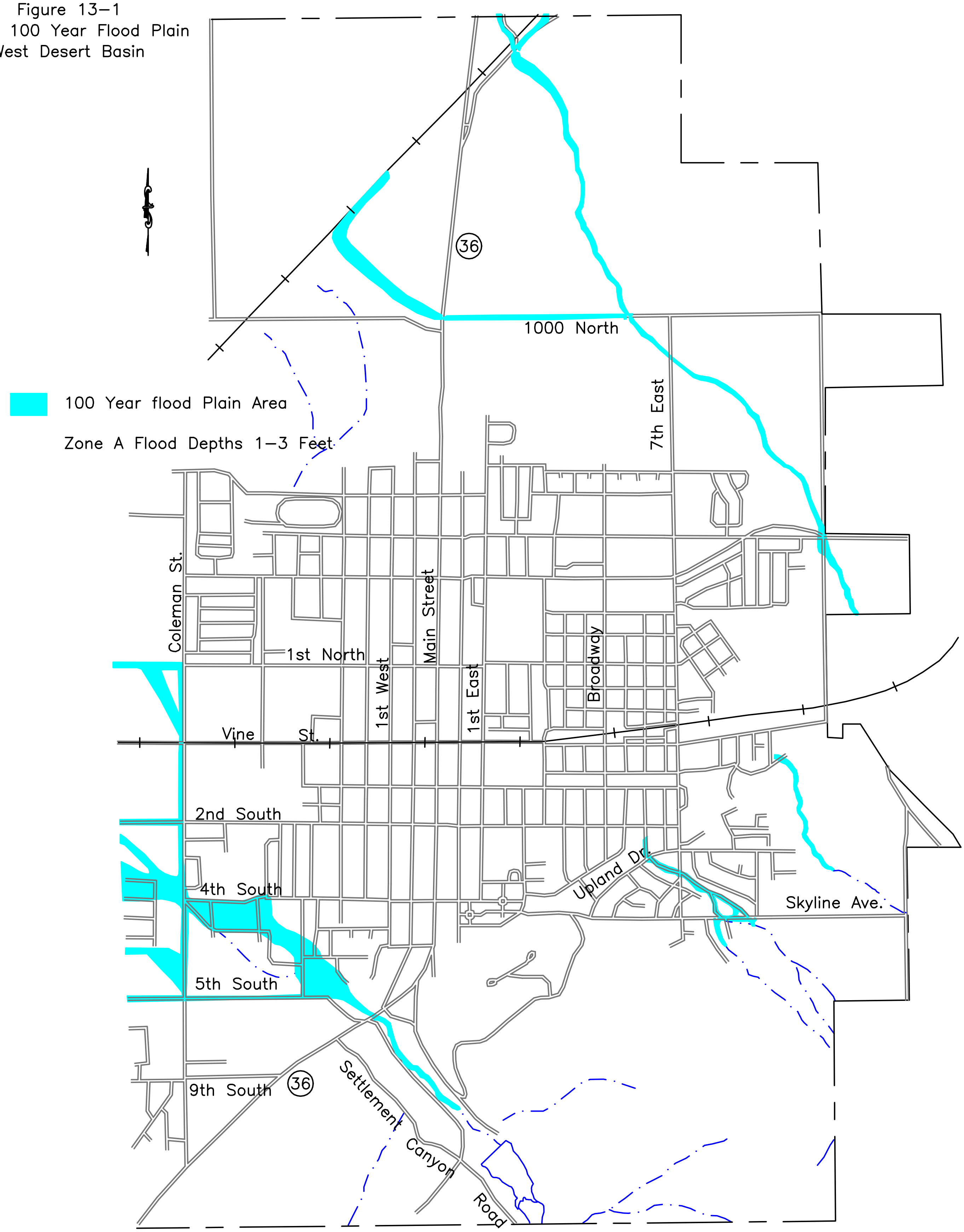
13.7.5 Improved Stream Channel Capacity

In the past, improving stream channel capacity has meant channel widening, straightening, dredging and/or concrete or riprap lining. Today's more environmentally sensitive society, however, requires that flood control planning be only part of a more holistic approach to stream management. Flood courses are seen by many as valuable riparian areas and corridors of wildlife habitat within the increasingly developed urban areas. Consequently increasing stream channel capacity must be accomplished in a way that is sensitive to these other interests.

13.8 DROUGHT REDUCTION ALTERNATIVES

In contrast to flooding, which tends to be more local in extent, drought is most often more broadly based across a basin, an entire state, or even an interstate region. For this reason, the state of Utah has historically adopted a state-wide drought management approach. A state Drought Response Plan has been prepared and is now in place to provide an effective means for the state to assess and respond to drought impacts. The plan came into being as a result of experience gained during the severe drought of 1977. The current Utah Drought Response Plan was prepared in 1990. The Division of Comprehensive Emergency Management is updating this plan.

Figure 13–1
Tooele 100 Year Flood Plain
West Desert Basin



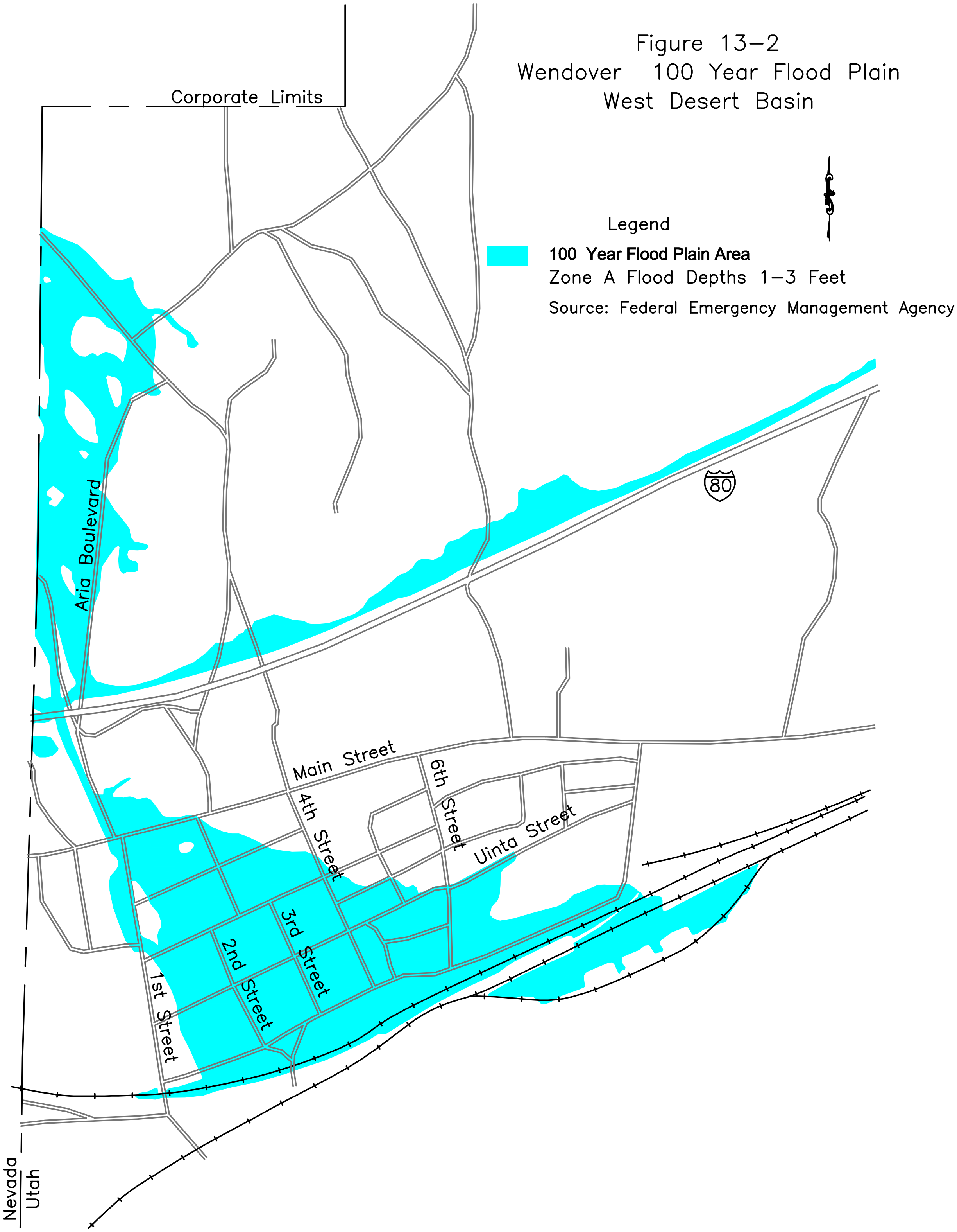
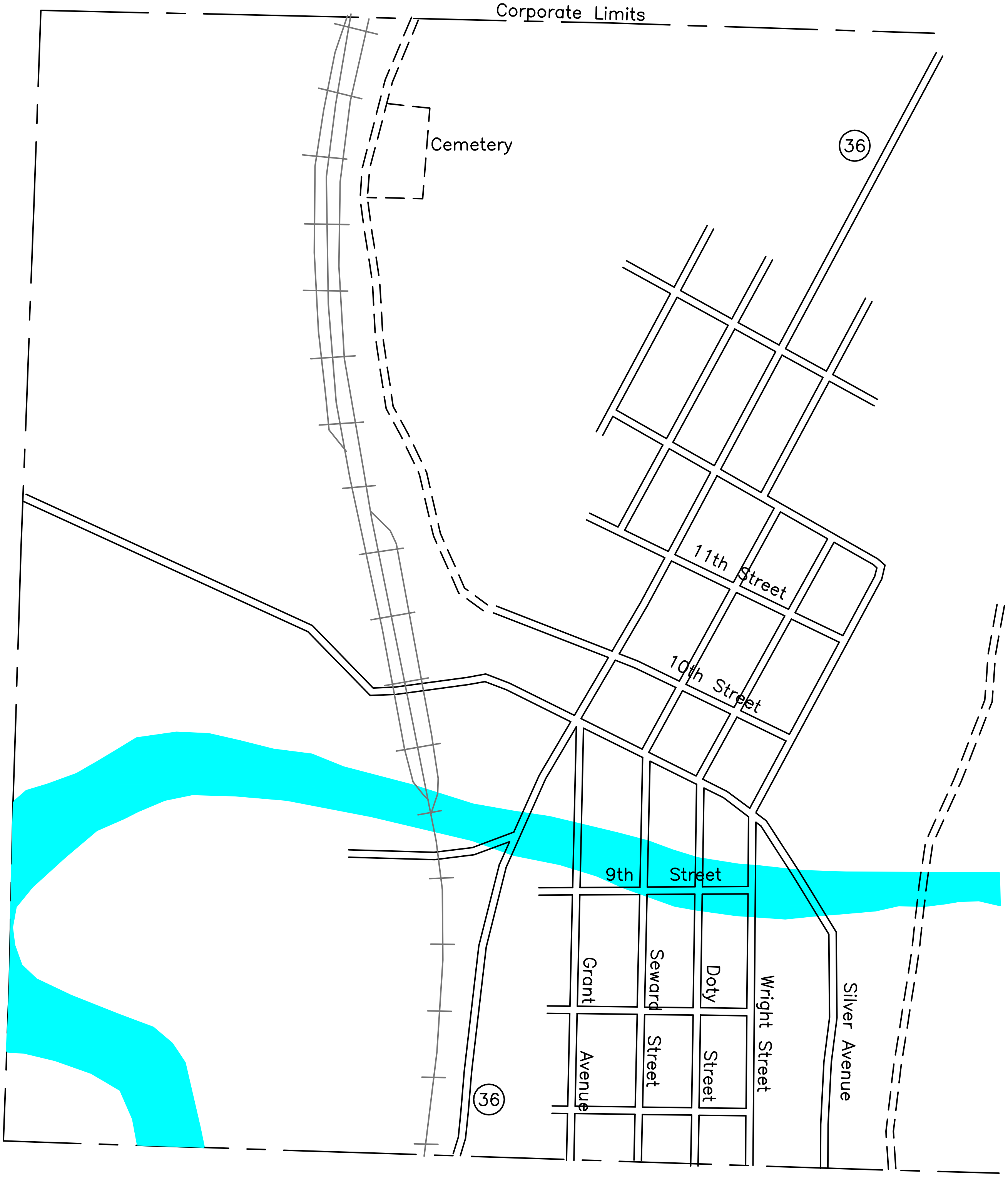


Figure 13-2
Wendover 100 Year Flood Plain
West Desert Basin
Legend
100 Year Flood Plain Area
Zone A Flood Depths 1-3 Feet
Source: Federal Emergency Management Agency
Corporate Limits
Aria Boulevard
80
Main Street
6th Street
4th Street
Uinta Street
3rd Street
2nd Street
1st Street
Nevada
Utah



Legend

100 Year Flood Plain Area
Zone A Flood Depths 1-3 Feet

Source: Federal Emergency Management Agency

Figure 13-3
Stockton 100 Year Flood Plain
West Desert Basin

Drought impacts can be reduced when the volume of precipitation is increased by weather modification through cloud seeding. However, this requires the right conditions to be most effective. During prolonged periods of drought, it may not be possible to significantly increase the precipitation although it is a viable alternative on a long-range basis. This will maintain the upper watershed soil moisture at a higher level which will tend to moderate the effects of drought. Good management of the upper watersheds is one of the best alternatives to alleviate the impacts of drought.

13.9 OTHER EMERGENCY ALTERNATIVES

The "other" water-related emergency problems described in subsection 13.6 are local in nature. Communities should have a disaster response plan. First response to any disaster should take place at the local level. Before any city, town or county appeals to the state or federal government for assistance, it should be certain that the event is beyond its capacity to handle the emergency. Local governments should develop disaster response plans with assistance from the Utah Division of Comprehensive Emergency Management and they should be coordinated with neighboring communities.

Contents

Section 14

West Desert Basin

Utah State Water Plan

Fishery and Wildlife

14.1 INTRODUCTION

This section describes the West Desert Basin's fish and wildlife resources, discusses existing and potential needs, and presents recommendations. It also describes associated problems and presents alternatives to improve this resource.

All forms of wildlife are dependent upon the availability of water, and are impacted by the quality of the basin's water supply. Clearly, the fisheries are dependent upon the quality of the aquatic habitat. But also, the quality of the riparian zone impacts amphibians, birds, mammals, leeches, mollusks and insects. Riparian vegetation provides food, cover, nesting sites for wildlife and impacts the stream's water temperature and other water quality parameters such as the nutrient load. Consequently, the health of the riparian zone impacts the aquatic zone and influences fish species, composition, population and size. Water development for various uses impacts the hydrologic regimes and associated riparian communities which affects fisheries and wildlife resources. For these reasons, it is important to understand the relationship of fisheries and wildlife to other water related uses.

14.2 SETTING

This is a typical high desert basin, which despite the relatively dry conditions supports a wide and abundant variety of desert wildlife. For the most part the basin is sparsely populated owing primarily to the limited water supply. Recreation has also been limited throughout the basin primarily due to the lack of water and the remoteness. While the relatively small number of humans living in the basin have limited the impact upon the native environment and the native wildlife, it does not imply that there is not the potential for more significant impacts. The natural environment of the desert basin is a fragile one with the potential for significant impacts from only marginal changes in the environment.

> Despite the dry nature of the West Desert Basin, wildlife is common throughout the basin especially along rivers, creeks, wetlands, wooded areas, and within the canyon and mountain areas.

14.2.1 Wildlife Species

Buffalo once grazed the grassier valleys of the eastern and northern portions of the basin. Today a buffalo herd is managed by the state on Antelope Island but the mule deer is now the principal big game animal in terms of numbers in the basin. Mule deer reside primarily in the foothills and mountains above 5,500 feet in elevation. Several antelope herds range in the valleys and plains of the central and western portions of the basin. Elk are well established in the Deep Creek Range and are in the Stansbury Range as well. A few black bears have survived in the mountain areas, and although cougars and bobcats were on the decrease during the first half of the century, it now appears that they are quite plentiful, along with a significant coyote population. Beavers are rare but marsh areas provide favorable habitat for muskrat. Upland areas support skunks, badgers, and fox. Jack rabbits inhabit range lands and cottontails are common on ranges and around farms. Common rodents include porcupines, ground squirrels, prairie dogs, chipmunks, and pack and kangaroo rats.

Thousands of birds are found in the marshes, in fresh water reservoirs and along the shorelines of the Great Salt Lake. Many migrating waterfowl stop here to rest, to feed or to nest and raise their young. Among the birds found in these waters are: Canadian and snow geese, whistling swans, green-winged teals, pintails, canvasbacks, and mallards. Hat and Carrington Islands and the marshes along the shoreline of the Great Salt Lake provide homes for thousands of gulls, egrets, ibis, comorants, avocets and numerous shorebirds.

There are several species of upland game birds found in the basin, including: mourning dove, sage grouse, blue grouse, ruffled grouse, and chukar. Quail and ringnecked pheasant are found only in localized areas. The native mourning doves are found in considerable numbers. Birds of prey include eagles, hawks, and owls. Scavengers include gulls, hawks, vultures, crows, magpies and jays. Among the numerous songbirds are robins, meadowlarks, sparrows, hummingbirds, warblers and woodpeckers. Snakes are common and include the garter snake, rattlesnake and the gopher snake. Amphibians include toads and frogs which can be found in ponds and streams.

14.2.2 Fisheries

Trout can be found in some of the mountain streams in the Stansbury Mountains, Pilot Mountains, and Deep Creek Mountains. Trout can also be found in Goose Creek and the Raft River. Bonneville cutthroat trout are found in streams on the Deep Creek Mountains and Lahontan cutthroat trout are found in streams in the Pilot Mountains. Bonneville cutthroat trout and Lahontan cutthroat trout are both listed by the State of Utah as species of special concern. The Division of Wildlife Resources has an active management program for these species that is based on a Conservation Agreement and Strategy prepared in cooperation with the U.S. Fish and Wildlife Service. Rainbow trout are stocked annually into Ophir Creek, South Willow Creek, Clover Creek, Locomotive Springs, Grantsville Reservoir, Settlement Canyon Reservoir, and Vernon Reservoir. Bass have been introduced into the area in a few upland reservoirs and can be found in some valley ponds. Carp can be found in low lying ponds associated with the springs and marshlands. The least chub, a native fish species with state species of special concern status, is found in some springs. The Utah chub and speckled dace are two native fish species which are also found in the basin.

14.2.3 Wildlife Habitat

Protection of flows in perennial and intermittent streams is not only important to native and sport fish, but is also important for maintaining healthy riparian areas. Riparian areas provide crucial habitat and migratory corridors for most species of wildlife that inhabit or pass through the West Desert. Riparian areas also help maintain water quality, moderate temperatures, and provide nutrient input for fish and other aquatic life.

Fish Springs

Wildlife habitat has been classified for a variety of key species according to a relative value system. For each species, four categories have been established. These are: Critical, high priority, substantial-value and limited-value. Distribution maps showing the various habitat classifications have been prepared for mule deer, antelope, elk, chukar partridge, forest grouse, sage grouse and cougar. Golden eagle nest sites have also been identified throughout the West Desert.

Mitigation goals vary with habitat value, wildlife species and project plans. There are several approaches to mitigation. These are listed below in order of importance:

- Avoiding the impact altogether by not taking a certain action.
- Minimizing impacts by limiting the magnitude of an action or its implementation.
- Rectifying the impact by repairing, rehabilitating or restoring the affected environment.
- Compensating for the impact by replacing or providing substitute resources or environment within the same area.

The West Desert provides winter habitat for a variety of raptor species. Bald eagles, rough-legged hawks and peregrine falcons are among the species that migrate into the West Desert valleys during the winter months, and golden eagles and red-tailed hawks are among the year-round residents. The ferruginous hawk, a state threatened species, nests in the West Desert and is particularly sensitive to human disturbance.

Wetlands are limited in the West Desert and provide critical habitat for wildlife. Several areas (Fish Springs, Gandy Marsh, and Leland Harris Marsh) support populations of least chub and western spotted frog, both listed by the State of Utah as species of special concern and are managed under conservation agreements.

The expansive wetlands associated with the Great Salt Lake and many other spring areas found in the basin are utilized heavily by shorebirds and waterfowl for resting, nesting and brood rearing throughout the year. As such, the wetted and surrounding riparian and terrestrial areas are a very important waterbird habitat.

14.3 Organizations and Regulations

The Division of Wildlife Resources has responsibility for the management, protection, propagation and conservation of the state's wildlife resources. Some federal agencies have limited authority for wildlife management on lands which they administer. U.S. Fish and Wildlife Service has authority over management of threatened and endangered species on all lands.

14.3.1 Local

Local irrigation companies control most of the water facilities affecting fish and wildlife. The impact may be either direct or indirect. Early irrigation rights holders were not required to leave water in the streams during times of low flow. Consequently there are no instream flow rights in the basin.

14.3.2 State

The Division of Wildlife Resources has general responsibility for the protection and management of resident fish and wildlife. Prior to 1973, wildlife management in Utah was almost entirely directed toward game species. In 1973, the Division of Wildlife Resources began a nongame wildlife program. Early focus was on raising funds for research and management. In 1975, the Utah State legislature funded a nongame biologist position and Utah became the first western state and only the seventeenth state in the nation with a nongame specialist. The present urban wildlife program has grown out of these nongame activities.

The Division of Wildlife Resources has the lead role in determining potential impacts (positive and negative) to wildlife resources from water development projects. The role of the Division of Wildlife Resources in water planning is to:

1. Assess water development plans and specifically:
   a. Identify potential benefits to wildlife and their habitats,
   b. Identify potential adverse impacts to wildlife and their habitats,
   c. Recommend a course of action to mitigate project impacts to wildlife and their habitat for the public interest, and
   d. Recommend termination if mitigation is not feasible or possible.
2. Provide factual information to decision makers regarding consequences of unmitigated and mitigated impacts to wildlife resources.

The Division of Wildlife Resources has prepared a Wildlife Habitat Conservation Plan to guide the actions of citizens, elected officials and the state's governmental agencies. The proposed plan was prepared from satellite photographs of existing vegetation and land use patterns in the counties. These images were processed by computer and field checked for accuracy. The habitat value of each area or "patch" was evaluated according to established criteria. The criteria used to determine habitat value included: size of vegetated patches, diversity of vegetation, level of disturbance, presence or proximity of water, and known use of the patch by wildlife.

The Division of Forestry, Fire and State Lands has the responsibility to manage state lands. Since the state owns all navigable waterways which do not fall under federal jurisdiction, the Division of Forestry, Fire and State Lands has management responsibility for the Great Salt Lake. The division also manages scattered tracts of land in the basin, some of which support fish and wildlife populations.

14.3.3 Federal

Primary federal responsibility for the protection and management of fish and wildlife populations rests with the U.S. Fish and Wildlife Service. This agency administers the requirements of federal acts relating to fish and wildlife, such as the Endangered Species Act of 1973. Federal Acts relating to fish and wildlife include the Migratory Bird Treaty Act, the Eagle Protection Act, and the Fish and Wildlife Coordination Act.

Some of the basin's fish and wildlife are within national forest and public domain land, managed by the Forest Service and Bureau of Land Management. These areas cover 5,661,560 acres or about 48 percent of the basin (See Figure 3-3).

The Corps of Engineers can also participate in improvement and restoration of fish and wildlife habitat through wetland and river meander restoration, restoration of riparian areas, and stabilization of riverbanks and beds. These efforts are accomplished through the Ecosystem Restoration Authorities and are cost shared with a local sponsor.

14.4 PROBLEMS AND NEEDS

There are not a lot of wildlife problems and needs in the basin. But the problems that do exist are important and are described as follows.

14.4.1 Great Salt Lake Management Plan

At the present time the biggest water-related wildlife problem in the West Desert Basin is the need to establish a comprehensive Great Salt Lake Management Plan that adequately addresses the wildlife issues associated with the Great Salt Lake and the surrounding wetlands. It is estimated that there are approximately 250,000 acres of wetlands surrounding the Great Salt Lake. This is a significant portion of the state's wetlands. At the same time, the Great Salt Lake is the ultimate receiving waters for storm runoff and wastewater treatment plant effluent from the million plus residents of the Wasatch Front and the Bear River Basin. For years storm runoff has carried toxic pollutants into the lake and wastewater treatment plant effluent has conveyed high nutrient loads into the lake. But there has been only limited scientific analysis of the impact these loads have had upon the Great Salt Lake.

In 1959, when the railroad constructed a causeway to replace the original wooden trestle the north arm of the lake was isolated from the rest of the lake. The resulting effect was the creation of two lakes instead of one. The north arm, isolated from fresh water inflow, has increased in salinity and is now at saturation while the south arm of the lake has freshened up to about 8 percent. Meanwhile, the lake's brine shrimp, which seem to do best at salinities between 13 and 19 percent, are on the decline. The declining brine shrimp population not only affects the brine shrimp industry but impacts wildlife that feed upon the brine shrimp.

Harvesting Brine Shrimp on the Great Salt Lake

14.4.2 Minimum Flows

Many of the streams in the basin are intermittent, exhibiting little or no flow for much of the year particularly in the late summer. Consequently irrigators have never been required to leave water in the channel in times of low flow. The absence of any minimum stream flow requirements has resulted in several small mountain streams having had most of their flow appropriated for uses outside the stream channel; thus, limiting the existence of aquatic species and reducing riparian corridors.

Some springs and seeps have also been developed in such a way as to preclude their use by the wildlife that had previously relied upon the water. While it may be necessary to develop culinary water sources in such a manner, agricultural or other uses should be developed so they do not deprive the existing wildlife of a necessary water source.

14.4.3 Wetlands and Riparian areas

Protection of marsh and riparian areas is vital in this basin. The scarcity of wetlands and riparian habitat in the West Desert basin makes these lands very valuable. For many wildlife and plant species, these areas are the only habitats where conditions permit their existence. Destruction of habitat is one reason plants and animals become classified as species of special concern.

Data collected over the years indicate the flow from the Locomotive Springs area is being reduced. This may be a natural occurring phenomena or it may be as a result of upstream diversion and development in Curlew valley. The Locomotive Springs area is considered a vital wetlands habitat area. The loss of flow there has the potential of becoming a very important issue. A study should be undertaken to quantify and qualify this problem and make recommendation.

14.5 ISSUES AND RECOMMENDATIONS

14.5.1 Maintaining wildlife watering sources

Issue - Maintenance of surface water sources, for wildlife, may be needed in areas where springs and seeps have been developed and piped for irrigation, culinary use, or livestock watering.

Discussion - This is a controversial issue. Wildlife managers believe the development of spring water sources has reduced water available for wildlife, and that critical wildlife habitat associated with seeps and springs is lost, as water is developed for other uses. Local farmers on the other hand insist that development of springs and seeps in the area has increased the availability of water for wildlife as well as livestock. They maintain that development of springs and seeps has reduced losses to evaporation, and extends the period of time the source produces water, to the benefit of wildlife as well as livestock.

Recommendation - Where springs and seeps have been developed, landowners and wildlife managers should work together to leave a minimal amount of water available for wildlife use.

14.5.2 Instream flows

Issue - Maintenance of existing flows in streams that currently support Bonneville or Lahontan cutthroat trout.

Discussion - Trout habitat is currently restricted to stream sections above the points of diversion. In most cases, the diversions are located at the mouths of the canyons, as on the Deep Creek and Pilot Mountains. Water development plans that call for moving a diversion upstream would have a significant impact on the resident trout populations. The movement of a diversion requires the submittal of a change application to the Division of Water Rights. For streams that support a state sensitive trout species, the Division of Wildlife Resources will view the proposal to move a diversion upstream as a significant impact to the natural stream environment.

Recommendation - Where state sensitive trout species habitat are adversely affected applications to move diversion points upstream should be carefully considered.

14.5.3 Wetlands and riparian habitat

Issue - Protection of spring flows which provide water to many small wetland complexes throughout the area.

Discussion - It appears that some springs may be affected by increasing groundwater withdrawal. Reduced flows are changing or have changed the value of prior and existing wetlands for wildlife and some plant species.

Recommendation - Studies need to be undertaken to ensure that groundwater withdrawals are not adversely affecting spring flows nor impairing water rights associated with the existing wetlands. Where the spotted frog and least chub habitat are adversely affected, proposed groundwater withdrawals should not be approved. Current stream diversions and groundwater withdrawals should be assessed.

Contents

Section 15

West Desert Basin

Utah State Water Plan

Recreation

15.1 INTRODUCTION

The purpose of this section is to describe the West Desert Basin's water-related recreational resources, to identify problems and needs, and to offer some recommendations. This evaluation includes both passive and active recreational activities as well as resident and non-resident tourism and educational programs (i.e., recreation, interpretive, and skill training) performed in outdoor, water-enhanced settings (streams, lakes, wetlands, rivers, reservoirs, swimming pools, etc.). Water- related recreational activities can be divided into two groups; those requiring direct contact with the water and those recreational activities which benefit from the water in a less direct way. Activities which require direct contact with water include fishing, swimming, boating, sailing, wind surfing, scuba diving, water skiing, personal water craft use, jet skiing, and remote-controlled model boating. Recreational activities which benefit indirectly from the presence of water include hunting, camping, picnicking, bird watching, hiking, bicycle riding, mountain bike riding, ATV use and touring. These water-related activities typically rank among the most popular outdoor recreation activities.

In November of 1997, public network meetings were held in Ogden, Murray and West Valley. A series of seven questions were posed to determine the public's recommendations relating to recreation and open space. Responses were interesting and relevant to all land uses, including water development. The questions included: What new taxes should be imposed? What recreation uses are being jeopardized by growth? What top recreation venues need improvement? Who is responsible for providing recreation? Would respondents base their vote on political platforms relating to recreation? And what are the respondents perceived impacts of the Olympics? The following is a representative list of the consensus responses:

> Utah is the nation's second driest state. Access to and the availability of water, in all its natural and man-made settings, is extremely important to the recreating public in Utah.

- ♦ Growth is a huge problem with little planning coordination.
- ♦ There is a willingness to pay higher fees and taxes if there is strong accountability.
- ♦ Respondents want to participate in the early planning and policy making processes.
- ♦ The Great Salt Lake is considered very under-utilized for boating recreation.
- ♦ Public access to water resources should be preserved .
- ♦ Rural residents should be involved in the decisions, especially those affecting them.
- ♦ Boating and OHV (off highway vehicles) property taxes don't translate into services and facilities.

15.2 SETTING

Aside from the Great Salt Lake and a few small reservoirs, there are no major lakes or rivers in West Desert Basin. Consequently, except for activities on the Great Salt Lake and occasional water skiing on Rush Lake, there are few opportunities for recreational activities involving direct contact with water. The Fish Springs National Wildlife Refuge is located in the south-central portion of the Great Salt Lake Desert just east of Callao. This facility provides a unique recreational opportunity to visiting wildlife enthusiasts. Ultimately, its isolated setting results in few visitor-days to the refuge. In the northeast portion of the basin, the Great Salt Lake represents the largest recreational water attraction. Ever since the first settlers entered Salt Lake Valley, the Great Salt Lake has been a source of curiosity and a recreational attraction. Presently the recreational development along the shores of the Great Salt Lake have been confined to the east side counties (Salt Lake, Davis, and Morgan).

Saltair

Other water-related recreational activities include a few city and county parks that offer picnicking and other day-use activities in the immediate proximity to ponds, small lakes and streams.

The Forest Service manages approximately 1,791,140 acres of land in the mountainous regions of the West Desert Basin.

The State Division of Parks and Recreation manages recreation facilities at 26 state parks on over 100,000 acres of state lands. There are two state parks in the West Desert Basin: Antelope Island, and Great Salt Lake. The division statistics show a total of 7.6 million visitors to state parks each year. The division has major water access facilities at Willard Bay, Antelope Island, and the South Shore Marina on the Great Salt Lake. Total visitor-days at these sites exceeded one million visitors for 1997.

15.3 ORGANIZATIONS AND REGULATIONS

15.3.1 State

In 1957, the Utah Legislature created what is today the Division of Parks and Recreation. Lawmakers instructed the division to develop parks and recreation areas and to preserve and protect historical sites and scenic treasures. A boating program was added in 1959 and an off-highway vehicle program in 1971.

The division's mission statement as stated in Frontiers 2000: A System Plan to Guide Utah State Parks and Recreation into the 21st Century is to: "Enhance the quality of life in Utah through parks, people and programs." Fifteen major issues are revealed and discussed in the plan. Each has challenges, goals and recommendations for implementation. These include coordinating with other agencies, participating in the state water planning process, increased funding, establishing more partnerships, taking better care of existing facilities, utilizing volunteers, and providing better public education and training.

The Division of Parks and Recreation provides matching grants for river way and non-motorized trail enhancement. This program leverages state dollars with local dollars, requiring a 50 percent local match. Since 1991, 260 requests totaling $10.2 million have been received statewide. To date, 107 projects have been awarded funds totaling $3.2 million.

15.4 OUTDOOR RECREATIONAL FACILITIES AND USE

15.4.1 City and County Recreational Facilities

City and county recreational facilities range from golf courses and sports fields to picnic areas. All use water for large grass areas. Minor amounts are also used for culinary needs, for swimming pools and ice skating rinks or other such facilities.

15.4.2 State Parks

The Division of Parks and Recreation manages only one state park within the basin, Antelope Island State Park. One other park, the Great Salt Lake State Park is physically located within the boundaries of the Jordan River Basin, but since the park provides boat access to the Great Salt Lake it should be included in any discussion of the Great Salt Lake. Willard Bay State Park and Willard Bay itself are located within the boundaries of the Weber Basin and therefore are not considered part of the West Desert Basin. The close proximity, however, of Willard Bay and the Willard Bay State Park to the Great Salt Lake warrants mentioning the facilities considering the impact the park has on the Great Salt Lake and the West Desert Basin.

15.4.3 Federal Recreation Areas

Although there are no national parks, monuments or recreation areas within the West Desert Basin, the federal government manages thousands of acres, including Golden Spike National Historical Site. The largest portion of federally managed lands in the West Desert Basin, however, includes the Bureau of Land Management public domain lands and Forest Service lands. In addition to managing these lands and controlling the recreation on them, the federal government is involved in funding city, county and state recreational development through the National Park Service and the Land and Water Conservation Fund Grants (LWCF). This program provides 50 percent matching federal funds for outdoor recreational acquisition and development (See Table 15-1).

The U.S. Forest Service manages two national forests within the boundaries of the basin. The Sawtooth National Forest is located within the Columbia River Basin in the Northwest corner of the state and sections of the Wasatch-Cache National Forest are located south and west of Tooele Valley in the Stansbury and Sheeprock Mountains. Through the U.S. Fish and Wildlife Service, the federal government manages Fish Springs National Wildlife Refuge just south of the Great Salt Lake Desert.

15.4.4 State River Way Enhancement Program

A state-wide river-way enhancement program was set up by U.S. Senate Bill 143 in 1986 to reduce flood damage, enhance water quality, provide outdoor recreation, provide fishery and wildlife habitat, aid in water reclamation, protect cultural resources and provide a non-consumptive amenity in terms of functional open space along important river corridors throughout the state. This program is intended to protect river corridors and provide pubic access, which is a major statewide issue and need according to the Utah State Comprehensive Outdoor Recreation Plan’s (SCORP) planning process and public surveys.

15.5 RECREATIONAL ACTIVITY PROBLEMS AND NEEDS

15.5.1 Outdoor Recreation Survey

Management considerations are necessarily based on knowledge of what kinds of outdoor recreation is occurring in the basin. A major outdoor recreation survey was completed in 1991[1] on a statewide basis. It provided part of the data needed to update the SCORP.

The first question asked in the survey was: "What five (5) recreation activities do you most enjoy participating in as an individual?" Activities were selected from a prepared list. Figure 15-1 shows the 45 recreational activities selected by

Table 15-1
LAND AND WATER CONSERVATION FUND GRANTS
(1967-Present)

Project Sponsor	LWCF Grants	Total Project Value
Box Elder County		
Park Valley Park	$35,900	
Snowville Park	$10,500	
Total	$46,400	$92,800
Tooele County		
Tooele City Golf Course	$51,800	
Tooele County Legion Park	$14,000	
Grantsville City Park	$17,000	
Tooele Valley Rec. Center	$53,000	
Total	$135,800	$271,600
Beaver County		
Indian Peaks - Baker Canyon		
- wildlife range	$6,000	$12,000
Davis County		
Antelope Island State Park		
Acquisitions (2)	$1,800,000	
Development	$600,000	
Total	$2,400,000	$4,800,000
Total	$2,588,200	$5,176,400

residents as their favored individual recreational activities. Fishing was the number one response of residents, followed by walking, camping, golfing and picnicking.

Another question asked was: "In order of preference, what five (5) recreation activities does your family as a whole most enjoy?" Developed camping (camping in developed areas with services) was number one on the family chart; whereas, developed camping was number 3 on the individual participation list. Picnicking was 2nd on the "family activity" list followed by fishing, driving/sightseeing, and pool swimming. (Figure 15-2)

Family outdoor recreation activity is significant to development, design and management decisions in terms of the types of activity and the magnitude or frequency of individual versus family/group activity. Park use information validates the importance of providing group-use facilities at recreation sites.

Another important aspect of the survey was its assessment of the need for improved recreational facilities. One of the question asked was: "In my community, new opportunities/facilities should be developed for the following recreation activities:..." Golf and bicycling facilities topped the list of needed new opportunities followed by swimming pools, picnicking facilities and playgrounds. (See Figure 15-3.)

Another question asked in the survey was: "In my community, existing opportunities and/or facilities should be improved for which of the following recreation activities?" The responses, selected from an attached list, closely resembled those given for the new facilities question. The existing facilities listed as most needing enhancement were picnicking, bicycling, swimming pools and golfing (see Figure 15-4).

The final survey question asked: “What new facilities and opportunities are needed on a statewide basis (outside the community or immediate area)?” Fishing and developed camping topped the list followed by golf, wildlife, nature study, and picnicking, as shown in Figure 15-5. The first three also ranked high as local needs. Many of the preferred recreational activities and needed facilities involve direct contact with water and can be incorporated into future water development projects.

Another statewide survey conducted in 1995 revealed the following:

- More than 90 percent of respondents have visited a state park;
- On average the number of state parks visited was 7.8; The number visited in just the past 12 months was 3.4;
- Over 80 percent of respondents favor purchase of more land for state parks;
- 34 percent were very satisfied with Utah State Parks, and 60 percent were satisfied;
- Over two thirds (66%) favor limiting the number of people in the park at one time;
- Occasional closures are acceptable to allow vegetation to restore itself;
- Site characteristics, including water features, are the most important in the selection of new park locations;

FIGURE 15-1

FAVORED INDIVIDUAL OUTDOOR RECREATION

Survey Respondents Listed Their Top five Favored Individual Activities

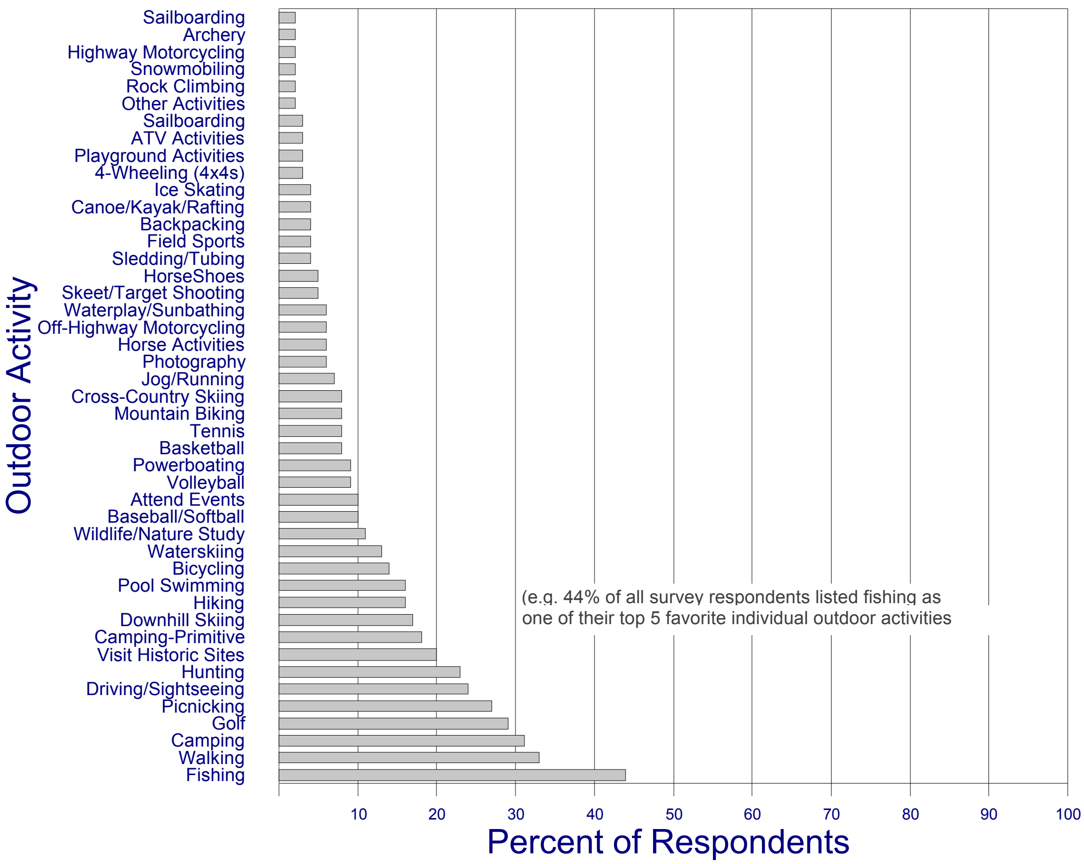
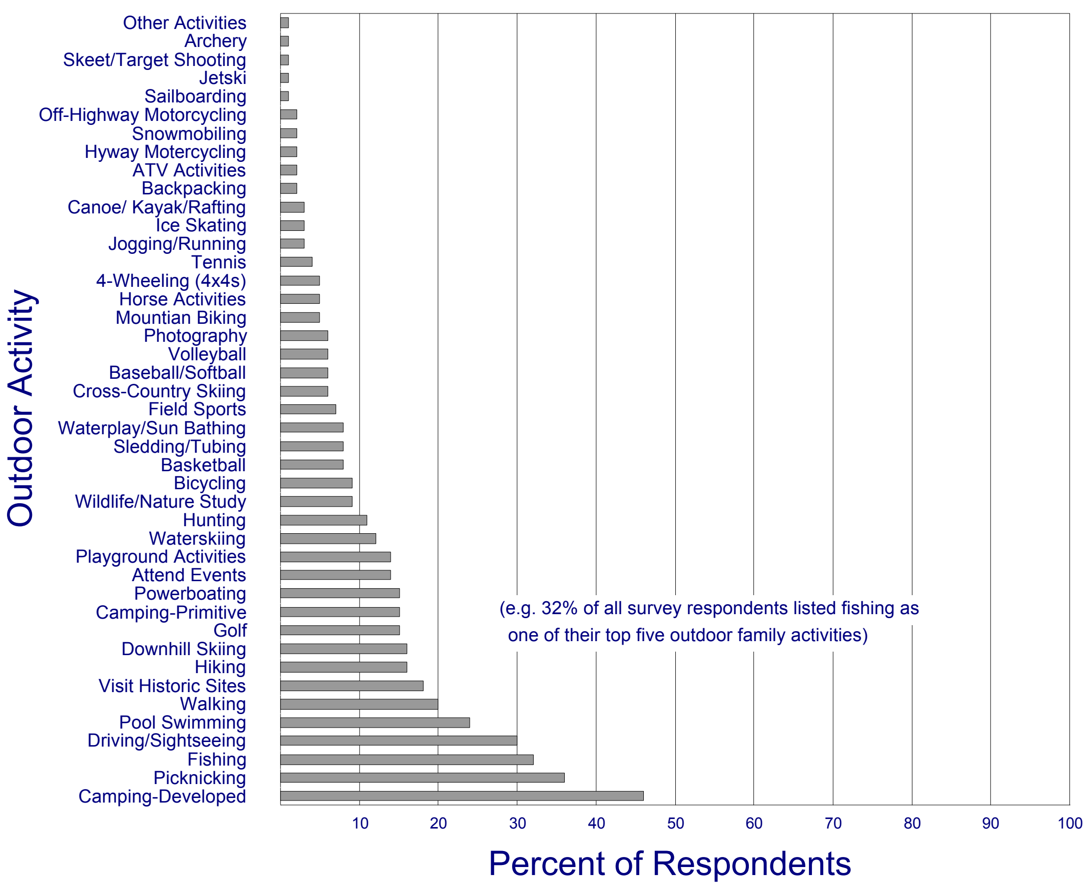


Figure 15-2

FAVORED FAMILY OUTDOOR RECREATION

Survey Respondents Listed Their Five Most Favored Family Activities



FIigure15-3

NEW COMMUNITY FACILITIES MOST NEEDED

Survey Responents listed the five most needed new Facilities

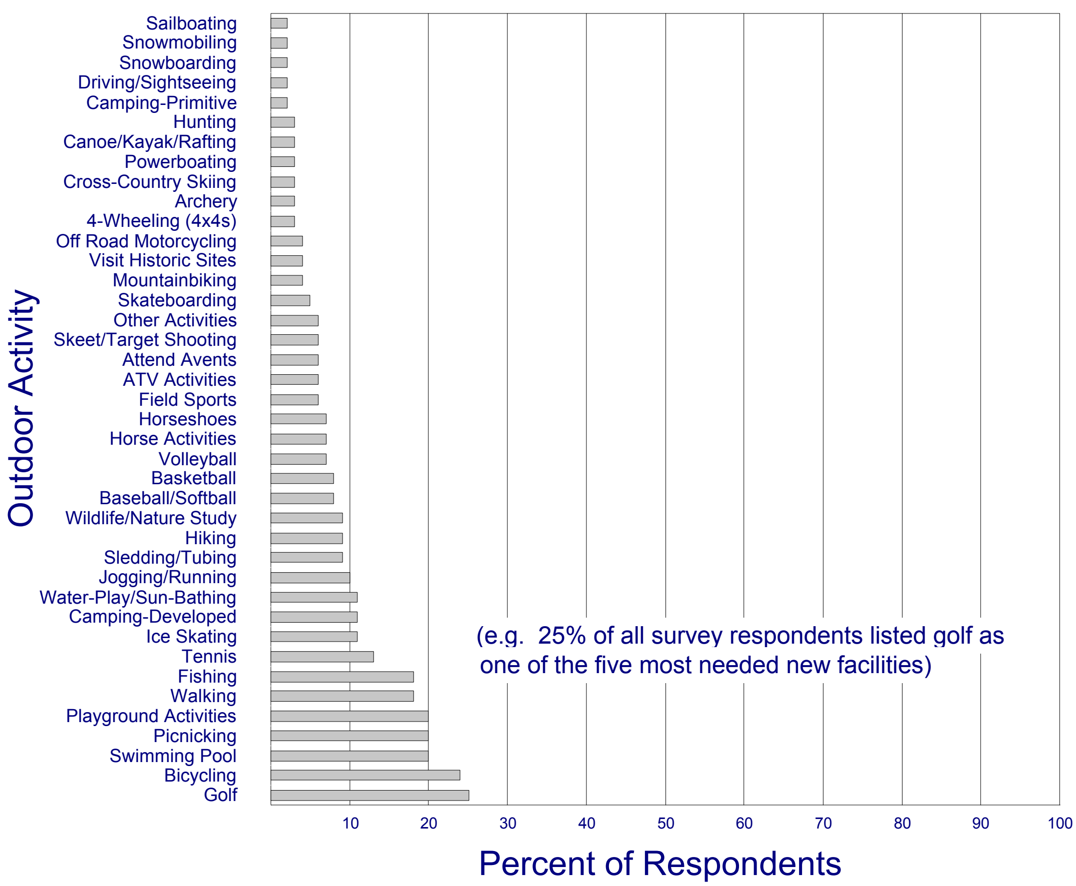


Figure 15-4

EXISTING FACILITIES ENHANCEMENT NEEDED

Survey Respondents Listed Five Existing Facilities Needing Enhancement

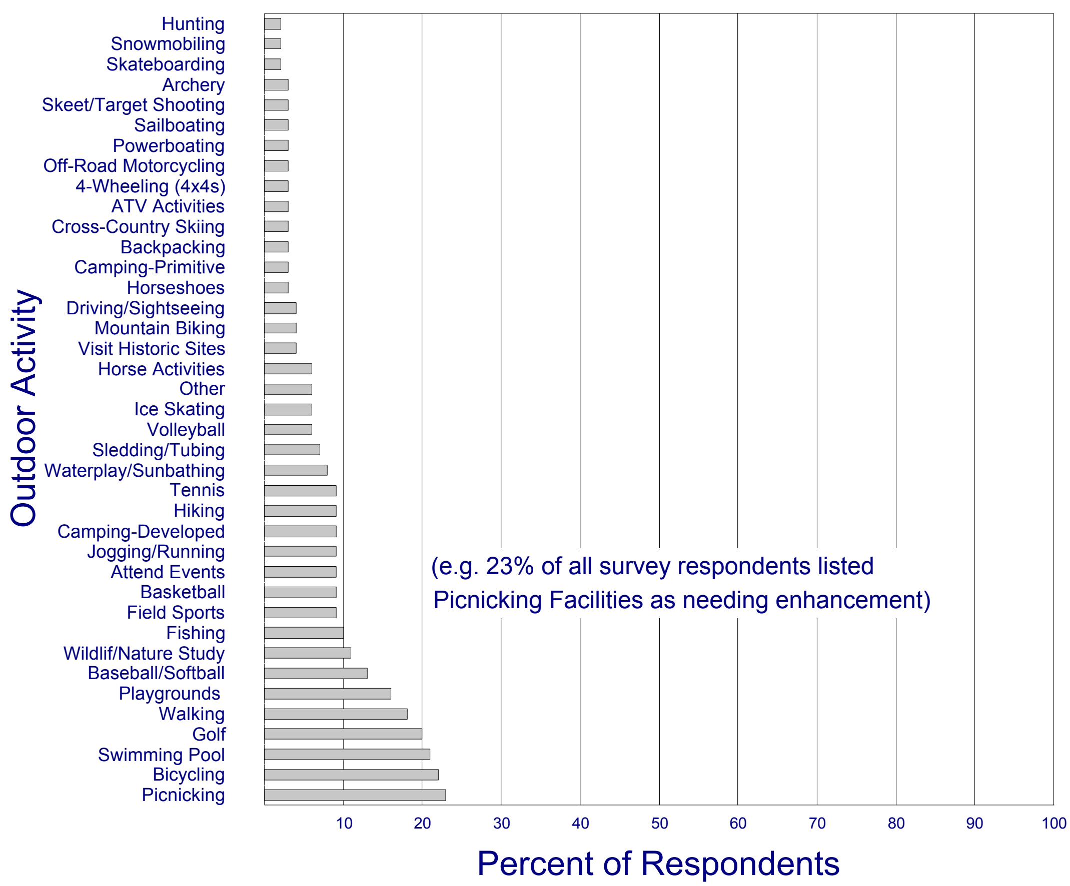
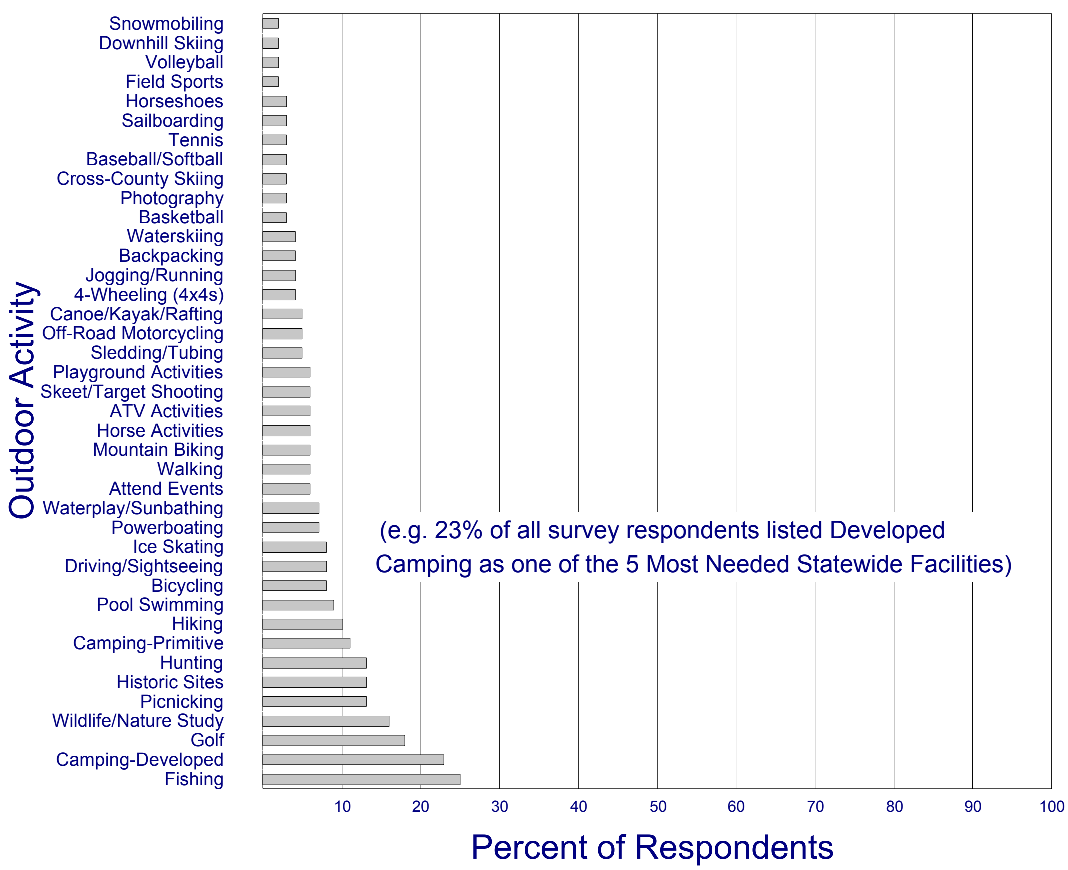


Figure 15-5

NEW STATEWIDE FACILITIES NEEDED

Survey Respondents Listed Five Most Needed Statewide Facilities



Contents

Section 16

West Desert Basin

Utah State Water Plan

Federal Water Planning and Development

16.1 INTRODUCTION

This section describes the involvement of federal agencies in West Desert Basin water planning and development, including both past and expected future involvement. Although the activities of federal agencies are changing, there are still many programs available to benefit basin residents. To make the best use of these programs requires the local entities to be knowledgeable of ways to access these benefits. With this information, it is possible to develop better interagency and local public working relationships.

16.2 BACKGROUND

The role of the federal government is changing from one of construction and development to one of management, preservation, conservation and maintenance. Federal funding programs are decreasing while regulatory programs are on the increase. With the change in federal agency activities, the state is being called upon to take a more active role in the planning and funding of local water projects. Although the federal government has decreased many funding programs, several federal agencies still have management responsibilities and regulatory authorities that are expected to continue indefinitely. Consequently, cooperative participation with federal agencies will continue to be very helpful to the state.

It is anticipated the state will also be called upon to shoulder additional financial responsibilities to carry out a number of federally mandated programs. Funding these federal programs may impair the state's ability to respond to other local requests for project funding.

> In the past, federal agencies have played a big role in funding water development projects. This practice is currently in transition with federal agencies decreasing their funding for water development, while increasing their regulatory responsibilities.

The primary concerns expressed by the various federal agencies in the 1990 Utah State Water Plan are: 1) Reserved water rights; 2) interrelated planning (multiple-use planning); 3) stream and riparian habitat loss; and, 4) water rights filings. An additional concern that has surfaced is coordination between federal, state and local officials. In recent years, progress has been made in each of these areas, particularly in the area of coordination between various federal, state and local agencies.

16.3 FEDERAL PROGRAMS AND FUTURE PLANNING AND DEVELOPMENT

The various federal agencies and the programs they provide are briefly described on the following pages. (Also see Section 8.) Some project planning and implementation actions being considered by various agencies are also discussed. On October 20, 1994, the Secretary of Agriculture signed a memorandum implementing the reorganization authorities contained in HR 4217, the Federal Crop Insurance Reform Act of 1994, Public Law No. 103-354. This reorganization changed the name and activities of some federal agricultural agencies involved in the state water planning effort. These changes, as they affect the State Water Plan, are briefly discussed in the following subsections. Two agencies, Bureau of Reclamation (BR) and the Corps of Engineers (COE), were primarily development oriented in the past, with emphasis on relatively large projects. At the present time, the BR is in a transitional phase with increasing emphasis on management of existing infrastructure while the COE has been increasing its regulatory responsibilities.

Pony Express Trail

16.3.1 Bureau of Land Management

The Federal Land Policy and Management Act gives the Bureau of Land Management (BLM) authority for inventory and comprehensive planning for all public lands and resources under its jurisdiction. This includes water quality considerations. Within the state as a whole, vast areas of land fall under BLM jurisdiction. In the West Desert Basin, the BLM manages 5,360,790 acres, nearly half of the land in the basin. See Figure 3-6 and 3-7 for locations. See Table 3-5 for a breakdown of land ownership and administration by county. The management of Public Domain is outlined in the bureau's *Pony Express Resource Management Plan*.

16.3.2 Bureau of Reclamation

The Bureau of Reclamation programs for water resources fall into four broad categories: investigations, research, loans and service. All require close cooperation with the concerned entities.

Investigation Programs - General investigations are conducted for both specific and multipurpose water resources projects, including environmental assessments.

Research Programs - The bureau conducts research in diverse scientific areas including materials science, alternative energy sources, atmospheric phenomena, and water science. Most programs are conducted in cooperation with other entities.

Loan Programs - These programs have provided federal loans to qualified organizations wishing to construct or improve small water resources projects. The bureau has recently reassessed its loan programs and concluded that they need major redirection. As a result, the bureau is no longer accepting applications for loans.

Grant Programs - Section 210 of Public Law 97-293, known as the Reclamation Reform Act, and the Reclamation Act of 1902, as Amended, established Bureau of Reclamation involvement in water management and conservation. The Bureau, under a memorandum of understanding with the Utah Division of Water Resources, established cost reimbursement funds to be used for public water conservation education, training, and water conservation and management plan preparation. In some cases, the division is required to match bureau funds with state monies.

Expected benefits include technical assistance being provided to willing water user groups. Classroom teachers will be trained in the use of Project WET materials. Public education activities will be conducted and public information materials will be produced.

Service Programs - These are intergovernmental specialized technical service programs designed to provide data, technical knowledge and expertise to states and local government agencies to help avoid duplication of special service functions. Local governments pay for requested services.

16.3.3 Cooperative State Research, Education, and Extension Service

This agency is assigned responsibility for all cooperative state and other research programs, all cooperative education and extension programs and such other functions related to cooperative research, education, and extension as may be assigned.

16.3.4 Corps of Engineers

In the past, the Corps of Engineers (COE) has been development oriented, with emphasis on large flood control projects. Today's COE, though still involved with flood control and mitigation, has taken on the additional role of regulating the nation's wetlands and waterways. As part of the federal permitting process (Section 404 of the Clean Water Act), the COE now investigates the technical feasibility, environmental impacts and social acceptability of any channel improvement or development in the wetlands and water courses of the United States.

Local entities and interest groups can petition Congress for assistance if they are unable to cope with large water resource problems. Requests for assistance with smaller problems can be requested directly from the Corps of Engineers. The COE can investigate economic and technical feasibility as well as social and environmental acceptability of feasible alternatives. When the problems cover an entire river basin, it is studied as a unit. Close coordination is maintained with local interests, the state and other federal agencies.

In 1996, the Corps of Engineers received authority from Congress to study and develop projects for the restoration of the environment. Appropriate objectives of such projects are the restoration of fish and wildlife habitat, wetland and river meander restoration, restoration of riparian areas, and stabilization of riverbanks and beds. The Corps also has authority under its Flood Plain Management Services Program to delineate areas and debris flow threats for local communities at no charge.

There have been 2 reconnaissance level studies: One study was on Settlement Canyon Dam and Creek; the other was a flood plain delineation and alternatives study at Wendover. There are no permanent Corps projects in the basin at this time.

16.3.5 Environmental Protection Agency

The Environmental Protection Agency (EPA) has regulatory responsibilities, particularly in water quality. The EPA programs dealing with water resources are the safe drinking water program under the Federal Safe Drinking Water Act (SDWA) of 1974, as amended in 1986 and 1996, and water pollution control under the Clean Water Act (CWA). The SDWA substantially increased the number of regulated drinking water contaminants, added new required treatment methods, and made other revisions. The 1996 amendment authorized more than $12 billion in federal funds for various drinking water programs and activities nationwide.

There are several aspects of the Clean Water Act including the following:

National Pollutant Discharge Elimination System (NPDES) - The NPDES program (Clean Water Act, Section 402) regulates the discharge of point sources of pollutants to waters of the United States.

Construction Grants - This program originally provided grant funds for construction of needed municipal wastewater treatment facilities. It was phased out in 1990 and replaced with a revolving loan fund managed by the state.

Water Quality Management Planning and Non-point Source Pollution Control - Section 205 (j) of the Clean Water Act provides funds to states to carry out water quality management planning. Section 319 of the act authorizes funding for implementation of non-point source pollution control measures under state leadership.

16.3.6 Farm Service Agency

Farm Service Agency (FSA) administers farm commodity, crop insurance, and conservation programs for farmers and ranchers. As of October 1995, FSA also administers the farm ownership and operating loans formerly provided by the Farmers Home Administration.

FSA's conservation programs include the Agricultural Conservation Program (ACP), the Emergency Conservation Program (ECP), and the Conservation Reserve Program (CRP). The ACP is a comprehensive program designed to reduce soil erosion, mitigate water pollution, protect and improve the condition of both cropland and pastures, conserve water, preserve and enhance wildlife habitat, and where possible, encourage the conservation of energy. Projects are evaluated at the local level on a case-by-case basis to determine consistency with the overall ACP objectives. The ACP is administered by state and county committees that are made up of local farmers and ranchers.

The ECP provides emergency cost-share funding for a number of farm-related disasters that include, but are not limited to: excessive wind erosion, floods and extended periods of extreme drought conditions. The CRP was established to encourage farmers, through contracts and annual payments, to reduce soil erosion. In addition, CRP eligibility has been expanded to promote the preservation and maintenance of wetlands, wildlife habitat and water quality.

The USDA Natural Resources Conservation Service, USDA Forest Service, and the Utah Division of Forestry, Fire and State Lands provide technical program guidance. The Utah State University Cooperative Extension Service provides educational support. (see Section 8).

16.3.7 Federal Emergency Management Agency

Federal Emergency Management Agency (FEMA) programs are related to disaster preparedness, assistance and mitigation. They provide technical assistance, loans and grants.

Presidential Declared Disaster - Following a presidential declaration of a major disaster, grants are available to the state and local governments for mitigation of disaster related damage.

Assistance Grants - FEMA can provide grants on a matching basis to help the state develop and improve disaster preparedness plans and develop effective state and local emergency management organizations. Also, grants are available to develop earthquake preparedness capabilities.

Flood Plain Management - FEMA provides technical assistance to reduce potential flood losses through flood plain management. This includes flood hazard studies to delineate flood plains, advisory services to prepare and administer flood plain management ordinances and assistance in enrolling in the National Flood Insurance Program. FEMA can also assist with the acquisition of structures in the flood plain that are repeatedly subjected to flooding.

16.3.8 Fish and Wildlife Service

The Fish and Wildlife Service (FWS) has jurisdictional responsibility over wildlife issues with national implications, such as migratory birds or threatened and endangered species. The Fish and Wildlife Service administers and operates the Fish Springs National Wildlife Refuge in Dugway Utah. The Fish Springs Wildlife Refuge encompasses 17,992 acres between the Fish Springs Range and the Black Hills at the southern end of the Great Salt Lake Desert. Five major springs and several lesser springs and seeps, flow from a fault line at the base of the eastern front of the Fish Springs Mountain Range providing virtually all of the water for the refuge's 10,000-acre marsh system. Fish Springs provides vital habitat for migrating wetland birds that stop to rest and replenish energy stores before moving on.

Table 16-1 lists the species considered threatened or endangered which may occur in the West Desert Basin. The list changes over time as various species are added when they become threatened or are removed from the list as they recover. When any activity is planned which may impact a threatened or endangered species, it is the responsibility of the project sponsor to take actions to protect them. In addition, conservation agreements exist for the least chub and the spotted frog.

The FWS compiles lists of native animal and plant species for review and possible addition to the list of threatened or endangered species. Such species are generally referred to as candidates. While these species presently have no legal protection under the Endangered Species Act, it is within the spirit of the Act to consider project impacts to not only listed but candidate species as well. From a planning perspective, it is also prudent to consider the possibility that a candidate species could, in the future, be added to the list of threatened and endangered species. The candidate species listed for the West Desert Basin are the mountain plover, the least chub and the spotted frog.

When right-of-way permits are required on federal lands, the consultation requirement under the Fish and Wildlife Coordination Act is actuated. Any time there is federal involvement in a project Section 7 consultation with the FWS is required by the Federal Endangered Species Act. In any case, the permitting federal agency will review any proposed action and determine if the action would effect any listed species or its critical habitat. The Section 404 permitting process of the Clean Water Act administered by the Corps of Engineers also calls for Fish and Wildlife Service to review impacts to wetlands as well as threatened or endangered species.

Under the Migratory Bird Treaty Act, all migratory birds are protected with the exception of starlings, English sparrows and pigeons. The Endangered Species Act also prohibits the "taking" of a protected species. Any unpermitted activity on any land that results in a "take" of federally listed species constitutes violation of Section 9 of the Endangered Species Act. "Take" under the Act is defined as

Table 16-1
THREATENED AND ENDANGERED SPECIES
West Desert Basin

peregrine falcon	endangered
June sucker	endangered
Ute ladies' tresses	threatened
Lahontan cutthrought trout	threatened
Utah prairie dog	threatened
spotted owl	threatened
least chub	proposed endangered
spotted frog	proposed threatened
mountain plover	proposed threatened

"harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or to attempt to engage in any such conduct." This can include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

16.3.9 Forest Service

The Forest Service manages the Sawtooth National Forest, a total of 71,870 acres in the extreme northwest corner of the state. The Forest Service also manages 117,640 acres of Wasatch National Forest in Tooele County, and the Desert Range Experimental Station in Millard County (55,500 acres).

Water-related programs of the Forest Service include watershed management; special use authorization for water development projects; and coordination with local, state and federal agencies. They also manage wilderness areas located on national forest lands.

Watershed Management - Proper watershed management and protection can insure that activities will not cause undue soil erosion and stream sedimentation, or result in reduced soil productivity or degradation of water quality. Water yields can also be affected as a result of a well planned timber harvest. Potential increases may approach 0.5 acre-foot per acre for some treated areas, but multiple-use considerations and specific on-site conditions may limit actual increases.

Special Use Authorization - Construction and operation of reservoirs, conveyance ditches, hydropower facilities and other water resources developments requires special use authorization and usually an annual fee. Special use authorizations contain conditions necessary to protect all other resource uses. Coordination of water developments by others requires communication early in the planning process to guarantee environmental concerns are addressed.

16.3.10 Geological Survey

The U.S. Geological Survey (USGS) is mainly a data collection and research agency. Through its Water Resources Division, it investigates the occurrence, quantity, distribution and movement of surface water and groundwater and coordinates federal water data acquisition activities. The USGS performs continuing programs in cooperation (cost sharing) with various state and local agencies. These include water quality and water level changes in the groundwater, as well as surface water stream gauges that are monitored and evaluated.

16.3.11 Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) provides technical and financial assistance to conserve soil, water and related resources on non-federal land through local soil conservation districts. NRCS projects do not have to be approved by Congress, and are provided for by the Soil and Domestic Allotment Act of 1935. This Act calls for the development and implementation of a continuing program of soil and water conservation on all lands, regardless of ownership. In addition to working with individual landowners and governmental units the NRCS administers several other programs.

- Published soil surveys contain descriptions of an area's soils, their uses and management, and maps depicting the extent of these soils. The surveys give information for both federal and non-federal lands. Soil surveys have been conducted for the entire basin except for the Beaver County. However, only the soil surveys for Box Elder County have been published.

- Snow survey program provides for, and coordinates, surveys and prepare forecasts of seasonal water supplies. The NRCS cooperates with the National Weather

Service in making streamflow and flood forecasts.

- River basin studies - Technical and financial assistance for watershed protection and flood prevention and the emergency watershed protection program were all authorized by the Small Watershed Protection and Flood Prevention Program (PL-566). The Emergency Watershed Protection Program provides immediate technical and financial assistance to relieve hazards to life and property resulting from conditions created by natural disasters.

- Watershed Protection and flood prevention projects - The Watershed Protection and Flood Prevention Act (Public Law 83-566), provides technical and financial assistance at the request of local sponsors and in cooperation with local, state and federal agencies to prevent erosion, reduced flood damages, improve irrigation systems and control water pollution.

- Resource Conservation and Development project (RC&D) - provides assistance to governments and nonprofit organizations in multi-jurisdictional areas.

- Environmental Quality Incentives Program (EQIP) - The Environmental Quality Incentives Program provides technical, educational and financial assistance to eligible farmers and ranchers to address soil, water and related natural resources concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and ranchers in complying with federal, state and tribal environmental laws, and encourages environmental enhancement. The program is funded through the Commodity Credit Corporation. The purposes of the program is to achieve cost-sharing the implementation of a conservation plan, which includes structural, vegetative and land management practices on eligible land. Fifty percent of the funding will be targeted at natural resources concerns relating to livestock production, primarily in priority areas.

16.3.12 Rural Development

The Rural Development Agency, through the Rural Utilities Service, is authorized to provide financial assistance for water and waste disposal facilities in rural areas and towns of up to 10,000 people. Priority is given to public entities in areas serving less than 5,500 people. To be eligible for loan and grant funds, wastewater disposal systems must be consistent with state or subdivision development plans and regulation. Loans for Resource Conservation & Development Projects are also available.

Golden Spike National Monument

16.3.13 National Parks Service

The National Parks Service manages the Golden Spike Historic Site. The National Parks Service (NPS) promotes and regulates use of national parks, monuments and similar reservations to conserve the scenery, natural historic objects and wildlife. The NPS also provides for the enjoyment of these resources in such manner and by such means as will leave then unimpaired for the enjoyment of future generations.

16.4 PROSPECTS FOR FUTURE FEDERAL INVOLVEMENT

In the near future a significant portion of the West Desert basin will be designated as wilderness. The bill currently before congress proposes wilderness designation for 1.1 million acres of BLM and Forest Service land located primarily in the Newfoundland Mountains, the Pilot Range, and the Silver Island Mountains. The bill, however, will face strong opposition from environmental lobbyists who would increase the area to 2.6 million acres primarily in the same areas but also including lands in the Grouse Creek Mountains.

Aside from the impending wilderness designations there are no significant federal projects set for the immediate future in the West Desert Basin.

Contents

Section 17

West Desert Basin

Utah State Water Plan

Water Conservation

17.1 INTRODUCTION

This section discusses water conservation needs, issues, and potential alternatives, and makes recommendations for conserving water. In the State Water Plan, water conservation is defined as "wise use," which is much wider in scope than merely reducing water consumption. Presently, state water policy on conservation requires project sponsors seeking financial assistance from the state to prepare a Water Management and Conservation Plan.

Significant water use reductions can be, and have been, achieved when people understand the reasons to conserve, especially in times of drought. It must be remembered, though, that reducing demand for water is less important if there are no cost savings or if the water cannot be used for other desirable purposes.

Water conservation can be pursued through three strategies: (1) reducing water demand, (2) using the existing water supply more efficiently, and (3) increasing the water supply by operating the storage and delivery facilities more efficiently such as the elimination of conveyance losses, or through other means.

Examples of reducing the water demand are: increasing crop irrigation efficiency, restricting outside use, changes in landscaping practices, new efficient plumbing fixtures (i.e., low-flow toilets and low-flow shower nozzles), incentive pricing, and water education. Examples of using water more efficiently are: secondary (dual) systems, wastewater reuse, water right transfers, and conjunctive use. Examples of minimizing water losses are repairing and lining canals, leak detection programs, and efficient timing of water releases from storage facilities. All of these strategies can have valid applications in the West Desert Basin.

> To guide the management of water development projects, the Board of Water Resources has issued a policy statement that supports conservation and the wise use of water. It states that water conservation will be examined both as an alternative and a supplement to project proposals.

17.2 BACKGROUND

Whenever water is discussed in Utah, the term conservation will most likely be included. Water is a finite resource and the demands on its use are growing. However, future water shortages in this basin will more likely be the product of long-term drought and infrastructure problems than dramatic increases in municipal and industrial water demands. Since many of the basin's existing communities and their projected growth are quite small, many communities have existing water supplies that will be adequate for quite some time. One exception is Tooele Valley area which has experienced significant growth over the past decade and is expected to continue to experience a high population increase over the next couple of decades. The Wendover area is also projected to experience significant growth over the next couple of decades. Consequently

M&I water conservation for Wendover and Tooele Valley will likely be a growing issue as these communities increase in population and their existing water supplies are stretched to their limits. Throughout the rest of the basin, water conservation should be implemented where it can be shown to be a benefit to the community.

17.3 WATER CONSERVATION OPPORTUNITIES

This section includes a discussion of both municipal and industrial (M&I) conservation and agricultural water conservation practices. Agricultural water is typically untreated and of poorer quality than water designated for human consumption. By definition, M&I refers to all public water use. Therefore, untreated "secondary" water is included in the broad category of municipal and industrial water. The vast majority of M&I water, however, is treated culinary water delivered through public water systems. It is used for residential, commercial and industrial uses, and is most often treated to meet the regulatory standards for drinking water. Consequently, M&I water is expensive, especially when compared with the price of agricultural water. Obviously, water conservation strategies for these two types of water use are different.

Effective conservation programs combine activities designed to reduce the demand for water with measures to improve efficient delivery systems. Demand reduction should include educating customers on improving cropland and residential irrigation practices and landscape design. Culinary water demand reduction is also helped with a pricing schedule that provides customers an incentive to find ways to use water more efficiently. Delivery efficiency can be improved by system audits and installing new meters and other facilities to reduce measurable losses.

17.3.1 Water Conservation Advisory Board

The 1995 publication of various water conservation recommendations by the Utah Water Conservation Advisory Board offers a number of programs and means to effectively conserve a substantial percentage of M&I water. These recommendations include: 1) development of water management and conservation plans by major water provider agencies, 2) reduction of secondary water by replacing high water consuming landscaping with xeriscaping or landscaping with reduced water needs, 3) better overall management of water intensive businesses and large conveyance systems, and 4) implementation of water pricing measures/policies.

17.3.2 Agricultural Water Conservation

A land-use inventory for the Columbia River Drainage, completed in 1991, determined irrigated agricultural lands cover 4,870 acres. A land-use inventory for the Great Salt Lake Desert (The West Desert Basin excluding the Columbia River Drainage) completed in 1993, determined irrigated agricultural lands covered 78,700 acres. The current water right allotment within the basin is four acre-feet per acre. This means ideally up to 314,800 acre-feet of water could be diverted annually for irrigation in the Great Salt Lake Desert and up to 19,480 acre-feet of water can be diverted in the Columbia River Drainage. In contrast to these allocation figures, Table 10-2 shows that only an estimated 181,700 acre-feet of water is diverted for irrigation in the basin, including 12,200 acre-feet of estimated diversion in the Columbia River Drainage. Irrigators in the Columbia River Drainage divert only 63 percent of their allocated water right, while irrigators in the rest of the West Desert Basin divert only 57 percent of their allocated water right.

Of the four acre-feet allotment, about 2.3 acre-feet per acre is based on crop consumption. The remaining 1.7 acre-feet per acre is based on conveyance and application losses. Even if the conveyance and application losses could be entirely eliminated, the basin's irrigators would still need every bit of water they are currently diverting, and it still would not meet their crop consumption needs. Consequently, there is little opportunity for agricultural water conservation in the West Desert Basin. That is to say, agricultural water conservation would not result in reducing the amount of water diverted or consumed. Improving conveyance and application efficiencies would, however, stretch existing supplies to later in the season where storage is available and could result in higher crop yield.

Sprinkler irrigation

17.3.3 Municipal and Industrial Water Conservation

The 1998 Water Conservation Plan Act requires all water conservancy districts and water retailers serving more than 500 connections to prepare water conservation plans. These were to be submitted to the Division of Water Resources. Within the larger communities of Tooele and Grantsville, there are some effective water conservation measures that could be employed to reduce municipal water use. In any system there are unmetered water use and system losses. Although the unmetered uses include fire fighting and park watering, there is still potential for conserving residential water through maintenance and monitoring. Also, programs that improve efficiency of large landscaping systems, such as parks and cemeteries, can realize significant water reductions.

For smaller communities unmetered water use and system loss likely exists. As long as the existing supplies are adequate, such losses will probably go unchecked. But when existing supplies are stretched to their limits, it will be wise for such communities to consider conserving their existing supplies through metering and maintenance.

Residential Water Conservation - There are opportunities for conservation of residential water. Water-efficient appliances such as low-flow toilets and low-flow shower heads are only required in new construction. Most wholesale and retail water delivery price structuring provide little incentive for water conservation. The most inefficient use of residential water is over-watering of lawns and gardens. Education coupled with price incentives could accomplish a lot in terms of conserving residential water.

Commercial Water Conservation - Opportunity for water conservation is more limited in the commercial sector than in the residential sector. In fact, some commercial endeavors, such as laundries, have already implemented water conservation to reduce energy costs. It is likely, however, water pricing incentives and pretreatment of wastewater requirements would further motivate commercial businesses to reevaluate their water conservation efforts.

Industrial Water Conservation - Water pricing incentives will likely have a positive impact upon industries that receive water from public water systems.

17.4 CONSERVATION METHODS AND STRATEGIES

A wide range of water conservation methods have been employed in various regions of the country. The lessons learned in other states can be useful to Utah. However, it should be kept in mind that the outcome can be affected by differing circumstances. The following paragraphs provide a brief description and discussion of the conservation methods and strategies expected to produce the most favorable impacts in the West Desert Basin.

17.4.1 Institutionalizing Water Conservation

An effective water conservation program requires a cooperative effort by all segments of the public. One way to achieve this would be through an active water education and conservation program conducted by the public water utilities.

17.4.2 Public Information/Education

Since everyone is a water user, any significant gain in conservation is an accumulation of individual attitudes and efforts. Therefore, public education is essential in conserving water. The degree of success will be directly proportional to the public perception of the need for water conservation. Every public agency or private organization concerned with planning, developing or distributing water can make a difference through efforts in this regard. In Utah, water conservation materials are regularly mailed out to schools, water-user organizations, and individuals on request. These materials are part of a water education program by the Division of Water Resources. Other conservation objectives of the division's education program include water-efficient landscaping and gardening techniques and conversion to more efficient appliances such as low-flow toilets and low-flow shower heads. Educational programs continue to be directed at students in elementary and secondary schools assisted by Project WET, a consortium of water education agencies throughout the United States.

17.4.3 Water Measurement

Accurate measurement of water encourages conservation in several ways. Not only is each user assured a fair and equitable distribution and financial assessments, it is also a more business-like way to operate a system and maintain records. Where users pay according to the quantity of water they actually use, there is a built-in incentive to conserve, whether the use is irrigation, municipal, or industrial. Most community water systems are metered. However, there are properties, such as city parks, golf courses, and cemeteries, which lack meters.

Xeriscape

17.4.4 Landscaping and Home Water Savings

Reductions in per capita use of municipal water require changes in personal habits and traditional practices, both inside and outside the home. This requires a public perception of need, but it can produce significant savings.

- Inside, residents can install water-saving toilets and shower heads, check plumbing for leaks, take shorter showers, use automatic dishwashers and washing machines only for full loads, and avoid having faucets run for unnecessarily long periods while shaving or rinsing vegetables, dishes and other items.
- Outside, residents can avoid using a hose to clean driveways and stop letting water run constantly while washing a car. Landscaping practices can also be improved. The Division of Water Resources teaches and encourages the installation and planting of water-conserving landscapes. The principles include limiting lawn areas, using plants and trees with low water requirements,

irrigating only when needed, watering during morning or evening hours and improving soils in shrub and garden areas by using mulches.

17.4.5 Pricing

Pricing policies are suggested as a means of reducing per capita water use. Flat rates (same price for each unit of water) provide little incentive for consumers to conserve. Decreasing block rates (lower unit prices for larger volume) provide even less conservation incentive. "Take or pay" contracts, which provide water purveyors with the guaranteed revenue stream needed for bonding, do not promote any conservation below the contracted amount. Increasing block rates provide a greater conservation incentive for consumers. Under this pricing policy, consumers experience an increasing unit price for higher water consumption. To be effective, the increasing block rate must be substantial and would probably require strong public support.

One city, Tooele, has established a pricing structure that has an increasing unit price for overages. See Table 17-1. These unit price increases, however, are minimal and provide a small incentive to conserve. Grantsville and Stockton charge a flat rate for all water use above the base amount. Wendover's rate of $2.30 per 750 gallons is one of the highest in the state and provides a strong incentive for efficient use.

Setting water prices to encourage more efficient use requires consideration of several principles. They are as follows:

- **A conservation rate structure encourages a lower water use rate without causing a shortfall in system revenues.** To avoid revenue shortages the rate schedule should provide a base charge that is set to cover all fixed cost - those which do not vary with the amount of water delivered. It will cover all debt service, insurance, personnel etc. which must be paid regardless of how much water is taken from the system. All customers pay this charge whether they use any water or not. Variable costs - those that do vary with the amount of water delivered - should be covered by the volume charge, or what is often called the overage rate. Revenue from this part of the rate will vary with the amount of water delivered to customers and should cover the costs of all energy, treatment chemicals, etc.
- **A conservation rate structure provides for the identification of waste, rewards efficient use and penalizes excessive use.** In larger communities with more sophisticated billing and customer relations staffs, water use targets can become part of the conservation program with currently available weather station technologies, phone modems and computer billing programs. With targets in place for each customer, water over-use is readily identified, as are exemplary water efficient behaviors.
- **A conservation rate structure produces excess revenues from penalty rates that can be used to fund needed water conservation programs.** Water conservation comes at a cost. This cost can be added to the commodity portion of the rate, raising the price of each gallon of water delivered to the customer's meter. Revenue generated by the conservation portion of the rater schedule should be placed in a dedicated account and used to pay the cost of water conservation programs.
- **A conservation rate structure is supported by a water bill that clearly communicates the cost of wasted water to the responsible person.** The ideal water bill would present a target usage based on weather, landscaped area and other pertinent use factors; the amount of water delivered above (or below) the target use; and the rate (price) charged for the target usage and any excess. With this information, the customer is equipped with the information

Table 17-1 **Water Rates for Selected Communities**						
City/Town	Base Rate $	Base Allocation (gallons)	first overage ($/750 gallons)	up to (gallons)	second overage ($/750 gallons)	up to (gallons)
Tooele	10.00	0	.65	7,500	.70	unlimited
Grantsville	15.00	7,000	.70	unlimited		
Wendover	17.20	7,500	2.30	unlimited		
Stockton	17.00	16,000	1.06	unlimited		

needed to make intelligent choices about such things as landscape changes, spraying the driveway, washing the car, filling the pool and allowing teenagers to take half hour showers.

- **A conservation rate structure is supported by a person or staff who can respond to customer calls for help in reducing water usage**. Individual home owners who desire to stay within their targets and request assistance can be visited, given a soil probe and taught to properly irrigate their lawns and gardens. Water audits for golf courses, school grounds and other large areas can be provided by trained staff personnel or by private or extension service irrigation specialists.

Water rates can be structured in several ways, each of which uphold the above principles in whole or in part. A series of three tables are use to demonstrate two common rate structures and one that is relatively new to system managers and customers in Utah. to system managers.

The flat rate is very simple to administer and to understand. A base charge is paid every month regardless of water use. All water delivered through the water meter is charged at a flat rate. Table 17-2 shows how this rate structure works in a hypothetical family for one year.

The increasing block rate is more complex but simple to administer if the water supplier has the proper computer billing hardware and software. Table 17-3 shows how this rate structure works in a hypothetical family for one year.

Both the flat and increasing block rates can be constructed to encourage efficient water use without causing a shortfall in revenue. This can be done by having the base charge set to cover fixed costs and the commodity charge set to cover variable costs.

Neither has a specific feature to identify wasteful or efficient behaviors. Under both, a water bill could be devised to show how much water is being used. A charge for each overage may encourage more efficient use. Both rate structures can be supported by a staff who responds to customer calls for help in reducing water use.

The ascending block rate is more complex. It provides a water use target for each customer based on size of landscaped area, family size and current weather conditions as measured by evapotranspiration. Irrigation application efficiency is also accounted for in setting the targets. Table 17-4 shows how this rate structure works in a hypothetical family for one year.

17.4.6 Secondary or "Dual" Systems

Secondary water systems, also known as "dual" water systems, provide untreated water of moderate quality for outdoor uses, primarily lawn-watering and gardening. The construction of these systems allows the use of lower quality

Table 17-2
FLAT RATE WATER PRICING

Month	Usage (kgal)	Base Charge ($)	Commodity Charge ($1.10/kgal)	Total ($)
Jan	5	10.00	5.50	15.50
Feb	6	10.00	6.60	16.60
Mar	9	10.00	9.90	19.90
Apr	13	10.00	14.30	24.30
May	38	10.00	41.80	51.80
Jun	48	10.00	52.80	62.80
Jul	53	10.00	58.30	68.30
Aug	48	10.00	52.80	62.80
Sep	29	10.00	31.90	41.90
Oct	13	10.00	14.30	24.30
Nov	9	10.00	9.90	19.90
Dec	6	10.00	6.60	16.60
TOTALS	277	120.00	305.80	424.70

Table 17-3
INCREASING BLOCK WATER PRICING

Month	Usage (kgal)	Base Charge ($)	Overage ($)			Total ($)
			0 gal to 10 kgal $0.90	10 gal to 20 kgal $1.00	Over 20 kgal $1.25	
Jan	5	10.00	4.50			14.50
Feb	6	10.00	5.40			15.40
Mar	9	10.00	8.10			18.10
Apr	13	10.00	9.00	3.00		23.00
May	38	10.00	9.00	10.00	22.50	51.50
Jun	48	10.00	9.00	10.00	35.00	64.00
Jul	53	10.00	9.00	10.00	41.25	70.25
Aug	48	10.00	9.00	10.00	35.00	64.00
Sep	29	10.00	9.00	10.00	11.25	40.25
Oct	13	10.00	9.00	3.00		22.00
Nov	9	10.00	8.10			18.10
Dec	6	10.00	5.40			15.40
TOTALS	277	120.00	94.50	58.00	145.00	416.50

Table 17-4 ASCENDING BLOCK WATER PRICING										
Month	Usage (kgal)	Base Charge ($)	Target use (kgal)	Irr Req[1] (ac-In)	Discount @ $.83	Conserve use @ $1.10	Ineff.[2] Use @ $2.20	Wasteful Use @ $4.40	Irres.[3] Use @ $8.80	Total
Jan	5	10.00	15	0	4.13					14.13
Feb	6	10.00	15	0	4.95					14.95
Mar	9	10.00	15	0	7.43					17.43
Apr	13	10.00	29.75	0.2	10.73					20.73
May	38	10.00	39.59	2.0		41.80				51.80
Jun	48	10.00	45.60	3.9		50.16	5.27			65.44
Jul	53	10.00	48.92	4.7		53.81	8.97			72.79
Aug	48	10.00	45.60	3.9		50.16	5.27			65.44
Sep	29	10.00	33.44	1.7		36.78				46.78
Oct	13	10.00	29.75	0.2	10.73					20.73
Nov	9	10.00	15	0	7.43					17.43
Dec	6	10.00	15	0	4.95					14.95
Totals	277	120.00	347.65	16.6	50.35	232.71	19.51			422.56

Days in Billing Period = 30 Appl. Effic. = .65 Indoor use = 100 gpcd
Irr. Area = .21 ac. Family Size = 5
1) Irrigation requirements for turf grass of a typical northern Utah residence
2) Inefficient use
3) Irresponsible use

(untreated) water on lawns and gardens freeing up the existing high quality water for meeting growth. Because these systems require the construction of an additional water conveyance infrastructure, they can be expensive. Since retrofitting can be expensive, it is doubtful many new secondary water systems will be constructed in existing communities. In areas of new construction where an adequate secondary water supply exists, secondary systems may prove economical. However, secondary water systems are economical if the construction costs are less than the cost of enlarging the M&I system to meet future needs and the costs associated with treating the water to drinking water standards.

While there may be an economic incentive for building secondary water systems based on the cost of high quality treated water conserved, studies have shown that “secondary” systems do not promote overall water conservation. Since secondary water is less expensive than treated water and is seldom metered, consumers tend to use more of it when watering their lawns. Research is ongoing to build a meter that will stand up to untreated water. This would enable the metering of secondary water systems which would allow the implementation of pricing which would help control use.

17.4.7 Conjunctive Use

Conjunctive use of water supplies (also called "joint use") most often refers to the combined use of surface water and groundwater. Where both are available as a water supply, groundwater can be allowed to accumulate during wet years, and then pumped, as needed, in dry years to supplement surface water supplies. This is an excellent example of wise use because it manages the total water supply, maximizing system efficiency.

Similarly, treated and untreated water can be used jointly to conserve water as well as reduce costs. A secondary system to distribute untreated water for lawns and gardens allows use of a smaller system capacity of expensive treated water. A substantial portion of high-quality water in public systems is customarily used for lawn and garden watering.

17.4.8 Restricting Water Use

To make enough water available for necessary household and commercial use during periods of severe drought, the use of municipal water for lawn and garden watering and other outside uses has periodically been restricted in Utah. One of the easiest restrictions to monitor and enforce is to prohibit outside use during certain times of the day. In the most severe cases, all outside use has been temporarily prohibited. The public has accepted these restrictions when they understand the necessity and realize the situation is temporary. But it is doubtful the public would accept such restrictions if they perceived them to be unnecessary or artificially contrived.

Tooele City Golf Course (under construction)

Because of the loss of water to evaporation on hot summer days, some water districts prohibit lawn watering between the hours 10 a.m. to 6 p.m. The estimated loss from evaporation during these hours is 10 to 15 percent of the applied water. Restriction of daytime watering is a recommendation of the Utah Water Conservation Advisory Board and could be implemented rather easily in most jurisdictions.

17.4.9 Wastewater Reuse

One effective method of conserving existing water supplies would be to establish a system of reuse. To some extent, current water supplies are reused as return flows from irrigation fields and effluent from wastewater treatment plants flows back into the natural waterways and underground aquifers. Tooele has been using effluent to irrigate alfalfa and has plans to use effluent to water a golf course in the near future. No direct reuse or recycling of wastewater for drinking water use has been universally accepted in the United States, except in emergency situations. However, reuse of wastewater for industrial, agricultural and other uses, such as golf course watering, is becoming more common. In the future, water reuse may become a more valuable tool in conserving the existing water supply.

Contents

Section 18

West Desert Basin

Utah State Water Plan

Industrial Water

18.1 INTRODUCTION

This section discusses the present and future uses of water for industrial purposes in the West Desert Basin. For this report, industrial water use is defined as water used in mining and manufacturing operations including the production of steel, chemicals, paper, and other products. It includes processing, washing, and cooling operations as well as employee use. Also included, to the extent that they can be identified, are such activities as gravel washing and ready-mix concrete production.

There is no single agency or entity in Utah that regulates the development or use of industrial water, although its use must conform to existing state laws for water rights, pollution control, and other regulations. The single biggest obstacle in identifying the basin's total industrial water use is the proprietary status with which many industries classify their water use statistics.

Morton Salt Corporation

18.2 SETTING

> Although the use of water by industry is small, it serves many uses and carries a high value. Water is used to generate power, as a solvent, for temperature control, for cleaning, to transport waste or other materials, and for aesthetics.

The primary industrial water use in the basin is for mineral extraction from Great Salt Lake. Six mining companies (AKZO Salt of Utah, Magnesium Corporation of America, Morton Salt, IMC Kalium Ogden Corp., (formerly Great Salt Lake Minerals), North American Salt Company and Mineral Resources International) annually use an estimated 170,961 acre-feet of Great Salt Lake water to extract salt, magnesium, potassium sulfate, magchloride, and other minerals from the lake. This water is diverted to shallow evaporation ponds where over time it is evaporated until the remaining brines have mineral concentrations sufficient to move on to the next step in the mineral extraction process.

18.3 CURRENT AND PROJECTED INDUSTRIAL WATER USE

The State Engineer’s Office has surveyed and published statewide industrial water-use data for several years. Although the State Engineer’s Office maintains confidentiality of the quantity of water used by individual industrial water users, the office has reported the collective 1995 total industrial water use in the West Desert Basin from privately held water rights as 13,760 acre-feet/year. The 1995 data on privately held industrial water rights is shown in Table 18-1. The majority of the privately developed industrial water comes from surface water sources. Kennecott Corporation exports 10,000 acre-feet per year to its Bingham canyon mining operation in the Jordan River Basin.

It is estimated that approximately 260 acre-feet of culinary water from existing public community water systems is used annually for industrial purposes. This figure represents about 4 percent of the existing culinary water use and is almost entirely in Tooele County, primarily in Tooele Valley.

At the present time, Box Elder County is involved in a study to develop ways to stimulate economic growth in western Box Elder County, primarily the Grouse Creek/Etna area. The study has identified several industries which have expressed an interest in developing facilities in the Lucin area (south of Grouse Creek) if an adequate water supply was available. These industries include: a rocket manufacturer, a tire-burning power plant, and a cement manufacturer. The development of any one, or more, of these industries in the Lucin area would significantly increase the amount of industrial water used in the Box Elder County sub-basin.

Water planners and managers need to provide for the future construction of treatment and distribution facilities to accommodate an expected increase in industrial water demand. In contrast to residential and commercial water uses which grow somewhat uniformly with population, future industrial use is difficult to predict. Future industrial uses could decline as industry types change or industries employ water conservation programs. For this report it has been assumed that industrial water use will grow in proportion to the increasing population. Without an accurate prediction of the new kinds of industries that will develop, it is not possible to make an accurate prediction of industrial water growth.

Table 18-1
PRESENT INDUSTRIAL WATER USE
acre-feet/year

	fresh	saline
Self Supplied Industrial water	3,760	243,700[1]
Exported from Tooele County by Kennecott Corp.	10,000	0
Public Water Supply - Culinary Systems	260	0
TOTAL	14,020	243,700

1. Includes 170,900 acre-feet diverted from the Great Salt Lake in Tooele County for mineral extraction and 62,800 acre-feet of Great Salt Lake water diverted in Weber County for mineral extraction

Contents

Section 19

West Desert Basin

Groundwater

19.1 INTRODUCTION

This section describes groundwater conditions in the West Desert Basin. The quality of the groundwater varies considerably throughout the basin. There are pockets of high quality water, Generally located near the mountain ranges. Further away from the mountains, water quality tends to decrease, principally because of increased salinity. There has been some recent concern over the potential contamination of groundwater along the eastern side of Tooele Valley. The USGS is conducting a study to determine if the heavy metals found in the mountains contribute to groundwater contamination when mountain runoff recharges valley aquifers.

Most of the Great Salt Lake Desert area is underlain with groundwater, much of which unfortunately exceeds present drinking water standards for salinity and other parameters. Due to the low precipitation and the very high evaporation rate in the region, only limited amounts of water are available to replenish the groundwater aquifers. Limited groundwater withdrawals are occurring in these areas of poor water quality, but they are concentrated in the areas used by the military, hazardous waste industries, and the few farms found in the region. The areas where groundwater quality is best in the basin are located along the margins of the mountain ranges where recharge takes place. In general, water quality decreases with distance from these recharge areas.

The U.S. Geological Survey has recently compiled information on part of the basin in an effort to categorize sites for isolation of high level nuclear waste. The portion of Utah includes Snake Valley, Tule Valley, Wah Wah Valley, and the Fish Springs Flat area, but does not include areas tributary to the Great Salt Lake such as Skull Valley or Tooele Valley.

> Groundwater is an important source of water for municipal, industrial, and agricultural uses in the West Desert Basin.

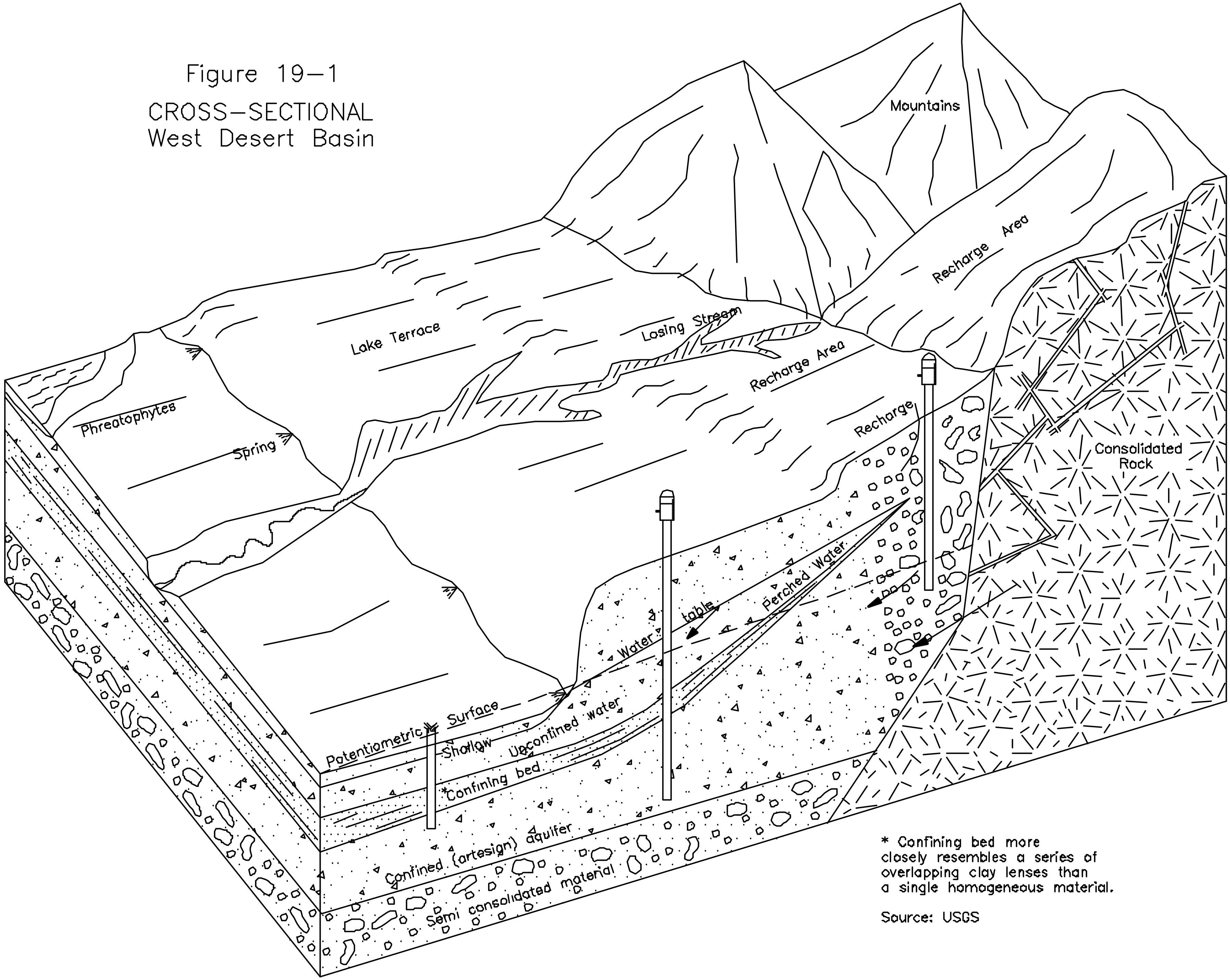
19.2 SUBSURFACE CONDITIONS AND AQUIFER CHARACTERISTICS

Groundwater is found in both consolidated rocks and in unconsolidated basin-fill deposits. The typical configuration of the unconsolidated, or alluvial, aquifer is shown in Figure 19-1, where permeable deposits of sand and gravel are recharged by streams issuing from the mouths of canyons, or from the fractured rock of adjacent mountain blocks. Within the alluvial deposits, water may be unconfined, confined by an overlying impermeable bed, or perched on an underlying impermeable bed.

In consolidated rock, water occurs in pore spaces or fractures. Most rock in the basin is hard and brittle, and aquifer characteristics depend on local fracture properties; that is, whether fractures are open or closed, and whether they intersect to form a network. The most important consolidated-rock aquifers are the carbonate rocks (limestone and dolomite), that in many places form large gathering systems which discharge in single large springs

Figure 19–1

CROSS–SECTIONAL
West Desert Basin



* Confining bed more closely resembles a series of overlapping clay lenses than a single homogeneous material.

Source: USGS

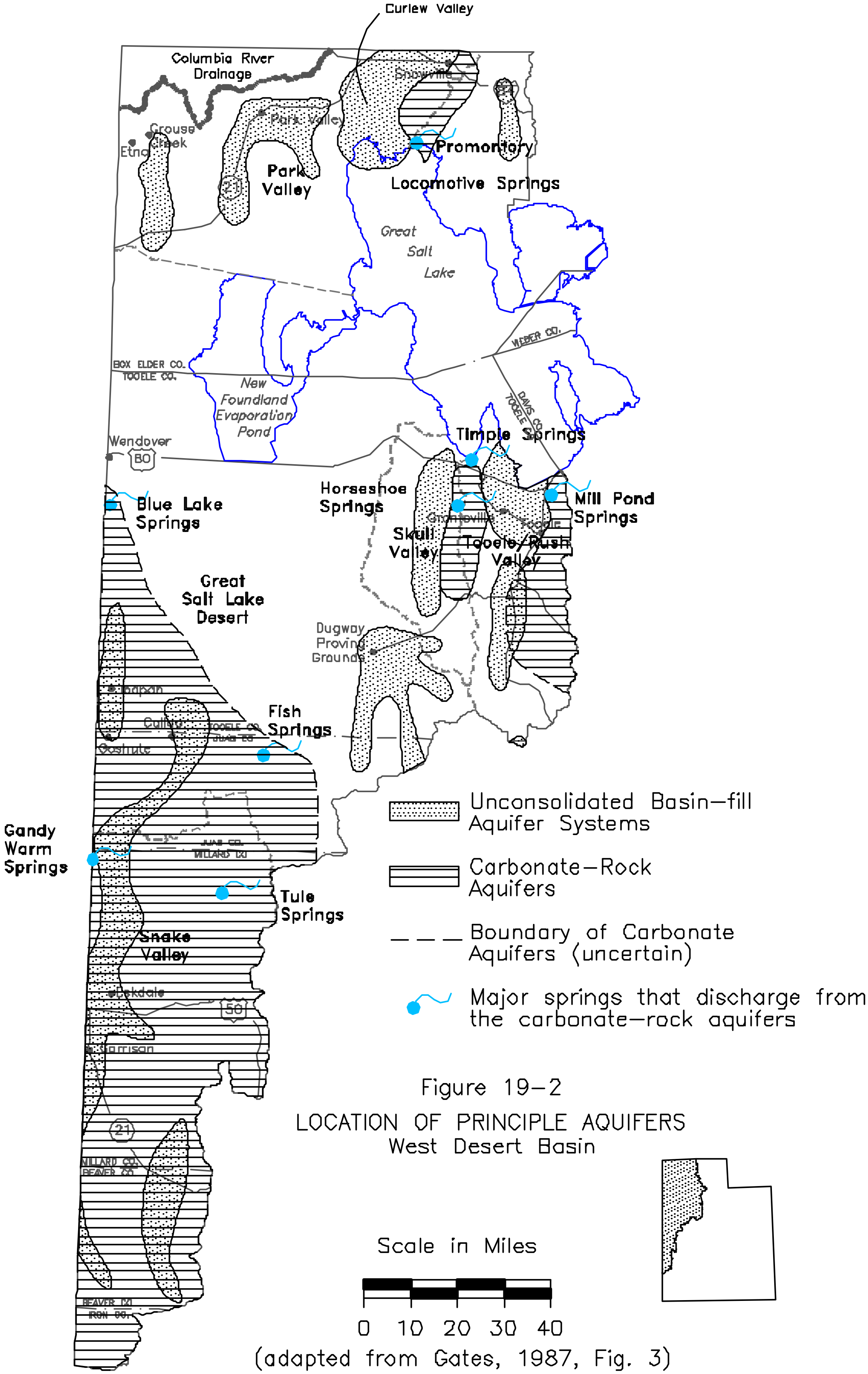


Figure 19-2
LOCATION OF PRINCIPLE AQUIFERS
West Desert Basin

(adapted from Gates, 1987, Fig. 3)

or groups of springs. The distribution of the alluvial and carbonate aquifers is shown in Figure 19-2.

Carbonate rocks form groundwater circulation systems of regional extent by solution-enlargement of fracture networks within single blocks or units of rock. The largest and most dependable springs of the West Desert Basin are fed by these regional carbonate aquifers. Location of the major carbonate springs are shown in Figure 19-2. Many carbonate aquifers extend beyond the boundaries of individual valleys. Their flow systems do not always conform to surface water divides.

Part of Rush Valley's groundwater, for example, is believed to drain eastward beneath the Oquirrh Mountains to Fairfield Spring in Cedar Valley, and part drains northward to Tooele Valley.

The major regional springs are listed in Table 19-1. These springs are characterized by relatively large discharge, low variability of discharge, and temperatures of 20^{o}C. or higher, implying large storage and a long, deep flow path.

Part of Rush Valley's groundwater, for example, is believed to drain eastward beneath the Oquirrh Mountains to Fairfield Spring in Cedar Valley, and part drains northward to Tooele Valley.

The major regional springs are listed in Table 19-1. These springs are characterized by relatively large discharge, low variability of discharge, and temperatures of 20^{o}C. or higher, implying large storage and a long, deep flow path.

The U.S. Geological Survey (USGS Water Resources Investigations Report 83-4122) has published data, compiled during the MX missile studies, on the groundwater in western Utah. These data include estimates of groundwater withdrawal (Bedinger, Gates, and Stark, 1984), groundwater contours, springs, and depth to groundwater (Bedinger and others, 1984), and groundwater chemistry (Thompson and Nuter, 1984), displayed on maps at a scale of 1:500,000.

Table 19-1
Major Springs which Discharge from Regional Carbonate-Aquifer Systems
West Desert Basin

Subbasin	Spring	Location	Discharge	
			GPM	acre-feet/yr
Box Elder	Locomotive Springs	Curlew Valley	6,600	10,600
Tooele/Rush	Mill Pond Spring	Tooele Valley	1,100 -4,200	1,770-6,770
	Timpie Spring	Northwest Tooele Valley	2,400	3,870
GSL Desert	Horseshoe Spring	Skull Valley	500 - 2,000	800-3,200
	Blue Lake Spring	South of Wendover	11,200	18,000
	Fish Spring	South Great Salt Lake Desert	12,700	20,480
	Gandy Warm Spring	Northwest Snake Valley	3,600	5,800
	Tule Springs	Tule Valley	100	160

source: *Studies of geology and hydrology in the Basin and Range Province, southwestern United States, for isolation of high-level radioactive waste -- Characterization of the Bonneville Region, Utah and Nevada.* Bedinger, M.S, K.A. Sargent, and Wm.H. Langer, 1990,

19.3 GROUNDWATER WITHDRAWAL

The West Desert Basin has been divided into the four sub-basins shown on Figure 3-2. For these sub-basins, groundwater divides coincide roughly with surface water divides. However, for the individual valleys within these sub-basins, as listed in Table 19-2, groundwater may flow in the subsurface from one valley to another.

Table 19-2, from the USGS (Bedinger, Gates, and Stark, 1984), gives estimates of groundwater withdrawal by sub-basin. Withdrawal is production from wells and does not include spring discharge or consumption by wetlands, unless otherwise noted.

19.3.1 Box Elder County

The Box Elder County sub-basin consists of seven sub-areas: the Columbia River drainage, Grouse Creek, Park Valley, Curlew Valley, Hansel Valley, Blue Creek Valley, and the Promontory Mountains. Groundwater withdrawals for each of these areas are given in Table 19-2. Grouse Creek, the Park Valley-Kelton area, and Curlew Valley have very similar geology. These valleys are underlain by geologic basins containing sediments of Tertiary and Quaternary age. The unconsolidated basin fill deposits of Quaternary age are the most permeable, but most are thin and discontinuous. Much of the basin fill consists of Tertiary deposits which are fine-grained and partly consolidated, and generally less suitable as aquifers. In Park Valley, wells that have produced more than 100 gpm are located in the thicker packages of Quaternary alluvium deposited as ancient stream channels (Thompson and Mann, 1973,). In both Park Valley and Grouse Creek, water is also produced from clean sand and gravel layers within the Tertiary Salt Lake Formation (Thompson and Mann, 1973,). At Kelton, water-bearing alluvium is capped by Lake Bonneville sediments (Thompson and Mann, 1973,). During its West Box Elder County project study, the U.S. Bureau of Reclamation drilled two deep test wells in Park Valley which showed the underlying Paleozoic rock to be unproductive (Thompson and Mann, 1973,).

Locomotive Springs, in Curlew Valley at the north end of the Great Salt Lake, discharges 14.6 cfs of brackish water (Mundorff, 1971) from basalt which underlies the lake bed sediments. The ultimate source is probably the carbonate aquifer which underlies the Hansel Mountains and Curlew Valley.

The groundwater budget developed during the West Box Elder Study (USBR, 1973) is given in Table 19-3.

19.3.2 Great Salt Lake Desert

The Great Salt Lake Desert sub-basin includes the area west of the Great Salt Lake, south of the Box Elder County line, west of the Stansbury Mountains and the Sevier Lake Basin, and north of the Escalante Valley (Cedar-Beaver Basin). In the southern end of the sub-basin, mountains rising above 10,000 feet in elevation generate ephemeral streams and small perennial streams which provide recharge locally to Pilot Valley, Wah Wah Valley, Pine Valley, Tule (White) Valley, and Snake Valley.

Many of the fault block mountains are underlain by carbonate rocks which provide groundwater flow paths between basins. Therefore much of the southern Great Salt Lake Desert is hydrologically connected in what Gates (1987) calls the “Great Salt Lake Desert flow system.” This system ultimately discharges to Fish Springs Flat, the margins of the Bonneville Salt Flats and the Great Salt Lake. The Bonneville Salt Flats are located at the end of this flow system and, therefore, contains briny to brackish groundwater, which is currently of more interest as a mineral resource than as a water resource. Data for the larger Snake Valley subbasin has been recently compiled by the U.S. Geological Survey (Bedinger, Sargent, and Langer, 1990). Table 19-4 provides water budget estimates (recharge and discharge) for the valleys within the Great Salt Lake Desert.

Production of potash (potassium salts of carbonate sulfate, chloride, etc) from the briny

Table 19-2

Groundwater Withdrawals, West Desert Basin

Abstracted from Bedinger, Gates, and Stark, 1984

Area	Withdrawal (ac-ft/year)	Year(s) of Estimate	Source of Information
BOX ELDER COUNTY			
Columbia River Basin	N.A.	N.A.	
Grouse Creek Valley	2,000	1967	Hood and Price, 1970.
(Utah and Nevada)	3,000	1979	Herbert & others, 1980.
Park Valley	500	1968	Hood, 1971a.
	2,600	1979	Herbert & others, 1980.
Curlew Valley	27,200-33,500	1969-1972	Baker, 1974.
(Utah and Idaho)	33,500		Baker, 1974.
(Utah only)	25,700	1979	Baker, 1974.
Hansel Valley	Negligible	1969	Hood, 1971b.
Blue Creek Valley	500	1969-1970	Bolke & Price, 1972.
Promontory Mountains	2,000	1970	Stephens, 1974a.
TOOELE-RUSH VALLEY			
Tooele Valley	28,000	1977	Razem & Steiger, 1981.
	30,000	1979	Herbert & others, 1980.
Rush Valley	4,800	1966	Hood & others, 1969.
GREAT SALT LAKE DESERT			
Pilot Valley (Utah and Nevada)	200	1971	Stephens & Hood, 1973.
Northern Great Salt Lake Desert	4,700[1]	1971	Stephens, 1974a.
West Shore	100[1]	1970	Stephens, 1974a.
Southern Great Salt Lake Desert	1,500	1978	Gates & Kruer, 1981.
Sink Valley	40	1970	Price & Bolke, 1970. Stephens, 1974a.
Dugway Valley - Government Creek area	300	1967-1975	Stephens & Sumsion, 1978.
Fish Springs Flat	Negligible	1976-1977	Bolke & Sumsion, 1978.
Skull Valley	5,000	1965	Hood & Waddell, 1968.
Deep Creek Valley (Nevada and Utah)	600	1966-1967	Hood & Waddell, 1969.
Snake Valley	7,000	1964	Hood & Rush, 1965.
	18,000	1977	Gates & Kruer, 1981.
	15,700	1979	Herbert & others, 1980.
Tule Valley	35	1973-1974	Stephens, 1977.
Pine Valley	5	1972	Stephens, 1976.
Wah Wah Valley	Negligible	1972-1973	Stephens, 1974b.

1. Includes discharge from springs and drains.

TABLE 19-3
Groundwater budget, West Box Elder County
(acre-feet/year)

	Park Valley	Kelton	Grouse Creek
Recharge	24,000	3,000	14,000
Discharge			
Evapotranspiration	16,000	--	11,000
Wells	1,600	4,900	2,400
Subsurface outflow	6,500	--	2,000
Total (rounded)	24,000	5,000	15,000

groundwater of the Bonneville Salt Flats began in 1917, sponsored by the demand for minerals during World War I, and has continued intermittently since then (Gwynn, 1996). The brine resources of the flats was the subject of an early study by L.J. Turk (1973). Data on quantity and quality of the shallow groundwater in the flats and in Pilot Valley were gathered for the BLM by the U.S. Geological Survey during a study from 1975-1977 (Lines, 1978). The U.S. Geological Survey has recently undertaken studies to better define the movement of brine, and deposition of salts, within the Bonneville Salt Flats playa (Mason and Kipp, 1997).

When the Southern Pacific Railroad began work on the "Lucin cutoff" across the Great Salt Lake Desert in 1902, it undertook a groundwater exploration program for fresh water to keep its steam locomotives supplied with fresh water. Although the test wells proved unproductive, they provide much of what we know about the subsurface strata and groundwater to depths of 1000 feet in the central part of the basin (Schreiber, 1954). Test well data compiled from MX missile studies can be found in Mason and others (1985).

In their reconnaissance of the southern Great Salt Lake Desert (south of Interstate 80) Gates and Kruer (1981) state that large amounts of groundwater occur, but much of it is of poor quality and much of it is in fine-grained deposits that will not yield more than a few gallons per minute. Their estimates of recoverable water appear in Table 19-5. They also mapped the distribution of water quality.

Skull Valley

Because of its proximity to the Wasatch Front and its potential for development, Skull Valley has been the subject of several separate hydrologic studies. The most recent groundwater budget (Hood and Waddell, 1968) calculated a groundwater regime mostly in equilibrium, with 30,000 to 50,000 acre-feet of annual recharge balanced by 30,000 to 50,000 acre-feet of annual discharge (Table 19-4). Only in the vicinity of Dugway were declining water levels found, indicating a net withdrawal of water from storage. Hood and Waddell estimate 1.4 million acre-feet of groundwater could be withdrawn from storage by draining the upper 100 feet of the alluvial aquifer, of which about 1 million is fresh water (Table 19-5). More water could be developed without significantly affecting existing rights (Everett, 1957). More recently, information on the quantity and quality of groundwater in Skull Valley, Ripple Valley, and Puddle Valley has been summarized in the superconducting supercollider study (Dames and Moore, 1987).

TABLE 19-4

Groundwater Budgets for Valleys in the Southern Great Salt Lake Desert

(Data from Gates & Kruer, 1981, except as noted.)

(1000 acre-feet per year)

Area	Recharge				Discharge				
	precipitation	Subsurface inflow	Origin	Subtotal (rounded)	Evapo-transpiration	Wells, Springs,& Seeps	Subsurface Outflow	Destination	Subtotal (rounded)
Dugway Valley Government Creek area	7	<5[1]	Sevier Desert	12	<1	2.8	8[1,6]	Great Salt Lake Desert	12
Fish Springs Flat	4	31[2,7]	?	35	8	27	<.1[1]	Great Salt Lake Desert	35
Deep Creek Valley	17	0	-	17	15	1.6	0	-	17
Wah Wah Valley	7	3[2]	Pine Valley	10	.6	.9	8.5[2]	?	10
Pine Valley	21	0	-	21	5.5	1.6	14[2,6]	3 to Wah Wah Valley 11 to?	21
Tule Valley	7.6	32[2,7]	?	40	40	.13	0	-	40
Snake Valley	100[3]	4[2]	Spring Valley, NV	105±[3]	80	7	10[1,8]	Great Salt Lake Desert	112
							15[2]	Fish Springs Flat (?)	
Southern Great Salt Lake Desert	47[4]	19[2,7]	11 from Goshute, Antelope, and Tippitt Valleys in NV; 8 probably from same	84	63[5]	21	0	-	84
		18[1]	10 from Snake Valley; 8 from Dugway-Government Ck.						
Skull Valley[9]	40	0		40	30	10	1.2	Great Salt Lake	41
Totals (rounded)	251	112		364	243	72	57		372

1 Flow through unconsolidated basin fill
2 Flow through consolidated rock
3 Hood & Rush (1965, table 5) estimated 100,000 acre-feet/yr recharge from precipitation, then estimated total recharge to be about 105,000 acre-ft/yr (4,000 acre-ft/yr subsurface inflow + 100,000 acre-ft/yr = 15,000± acre-ft/yr). Although the figures do not balance, they are used in this report as they were given.
4 Includes 32,000 acre-ft of local precipitation on the mudflats
5 Includes 50,000 acre-ft of evaporation from the mudflats
6 Subsurface outflow estimated to balance the difference between recharge and discharge
7 Subsurface inflow estimated to balance the difference between discharge and recharge
8 Subsurface outflow (through consolidated rock) estimated to balance the difference between recharge and discharge; discharge greater than recharge because (1) much of the water discharged by wells is taken from groundwater storage, and (2) some of the water discharged by wells is intercepted discharge by evapotranspiration not accounted for in estimates of discharge by evapotranspiration
9 From Hood & Waddell, 1968; median of range of values

Table 19-5
Estimated Groundwater in Storage in the Southern Great Salt Lake Desert
(from Gates and Kuer, 1981)

Area	Assumed Specific Yield or Storage Coefficient	Groundwater Storage[1] (1,000 Acre-feet)	Remarks
Dugway Valley - Government Creek area	0.10	3,800	Fresh to moderately saline
Fish Springs Flat	.025	550	Slightly to moderately saline
Deep Creek Valley	.10	320	Mostly fresh
Southern Great Salt Lake Desert	.10	26	Freshwater only, north of Callao
Wah Wah Valley	-	([2])	Fresh to moderately saline (?)
Pine Valley	-	([2])	Mostly fresh (?)
Tule Valley	.10	680	Fresh to slightly saline
Snake Valley	.10	12,000	Fresh to slightly saline
Skull Valley	-	1,400	1,000 Fresh
Total		14,080	

1. Based on dewatering of the upper 100 ft (30 m) of saturated material
2. Insufficient data to use in estimating

19.3.3 Tooele/Rush Valley

Groundwater can be found virtually everywhere in Tooele Valley. In some areas it is at a greater depth than others. Some wells produce greater yields than others, but there are few areas in the valley where a well will not yield some water if it is drilled deep enough. Since 1963, the amount of groundwater withdrawal from wells has been as high as 33,000 acre-feet/year in 1974, but averages around 26,000 acre-feet per year.

The widespread availability of groundwater in Tooele Valley is due in most part to the structure of the valley. Tooele Valley is shaped like a bowl that has a piece broken from one side. This “broken piece” is the northern side where the valley is open to the Great Salt Lake. The Oquirrh Mountains on the east, South Mountain to the south, and Stansbury Mountains on the west form the sides of the bowl. The mountains consist primarily of rock. Similar rock makes up the bottom of the bowl under more than a thousand feet of alluvial and lake deposited sediments. Groundwater recharge, primarily from the mountains but also from precipitation onto the valley floor, flows toward the central portion of the valley and north to the Great Salt Lake.

The aquifer in the Erda area receives recharge from the Oquirrh Mountains. Many of the aquifers consist of coarse, well-sorted gravels that may be several hundred feet thick. Water from the Oquirrh Mountains also serves as the main source of recharge to the Tooele area, which also receives recharge water from the South Mountains and Rush Valley. The Grantsville area is recharged from the Stansbury Mountains. The aquifers in this area consist mostly of sandy layers, usually about 20 feet thick, separated by thin clayey layers. The aquifers in the Burmester area, in the northern part of the valley, receive water moving out of the Erda, Grantsville, and the Tooele areas. The aquifers in the Burmester area are typically thin beds of gravel or sand separated by large thicknesses of relatively impermeable clays. Aquifers in the Lake Point area are essentially separated from the rest of the valley and probably would be little affected by development in other areas. The recharge for the aquifer in the Lake Point area comes from the Oquirrh Mountains north of Bates Canyon aquifers in the Lake Point area containing freshwater are usually thin and consist of sandy gravel. (See Figure 19-4).

The quality of the groundwater throughout the valley varies considerably. Generally, in the eastern portion of the county, groundwater recharge comes from the Oquirrh mountains and water quality ranges from good to excellent. To some extent the same principle holds for the south end of the valley recharged by the South Mountains and the west side of the valley recharged by the Stansbury Mountains. But, recharge in these areas is not as substantial as from the Oquirrhs. Consequently, water quality on the south and west sides of the valley is not as influenced by the recharge as it is on the east side of the valley. As groundwater moves towards the valley center and towards the Great Salt Lake water quality deteriorates and becomes more brackish as total dissolved solids concentrations approach 10,000 mg/l. (See Figure 19-3)

Total groundwater recharge for the Tooele Valley is estimated to be 57,000 acre-feet/year. Approximately two-thirds of the recharge (39,200 acre-feet/year) is attributed to the Oquirrh Mountains. Groundwater movement from Rush Valley accounts for 5,000 acre-feet/year, while the South Mountains only contribute 500 acre-feet/year. The Stansbury mountains provide an estimated 12,300 acre-feet of groundwater recharge. See Table 19-6. There is a one-time groundwater storage reserve of about 200-500 thousand acre-feet.

Table 19-6
Tooele Valley Groundwater Recharge & Discharge
West Desert Basin
(acre-feet/year)

Source	Recharge
Oquirrh Mountains	11,300
Stansbury Mountains	36,200
South Mountains	500
Valley Precipitation	12,000
Unconsumed Irrigation	10,000
Groundwater from Rush Valley	5,000
Total	75,000
Source	**Discharge**
Withdrawal from pumped wells	13,500
Discharge from flowing wells	12,500
Evapotranspiration	23,000
Spring Discharge	16,000
Outflow to the Great Salt Lake, Shallow drains and ditches	10,000
Total	75,000

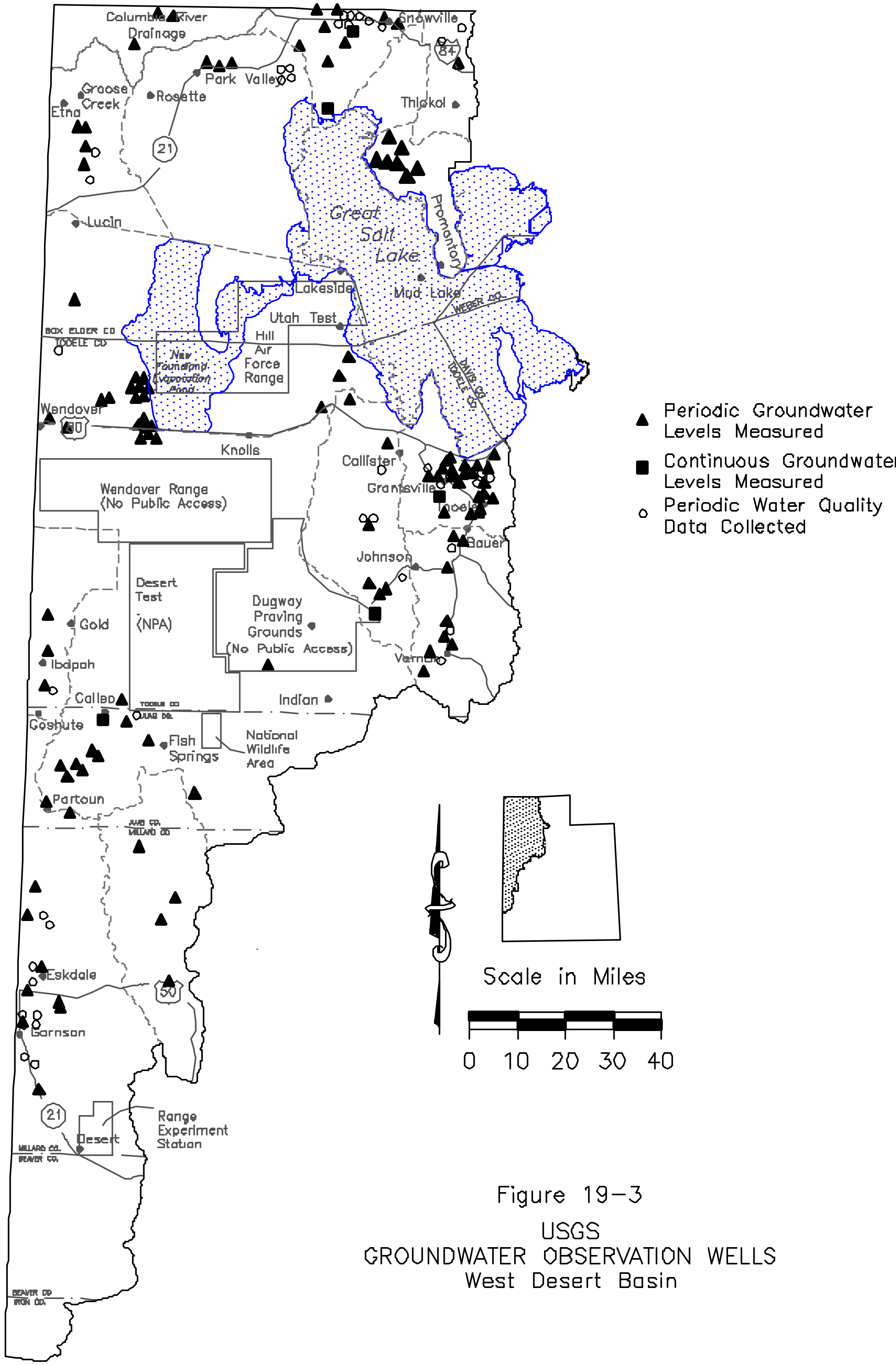


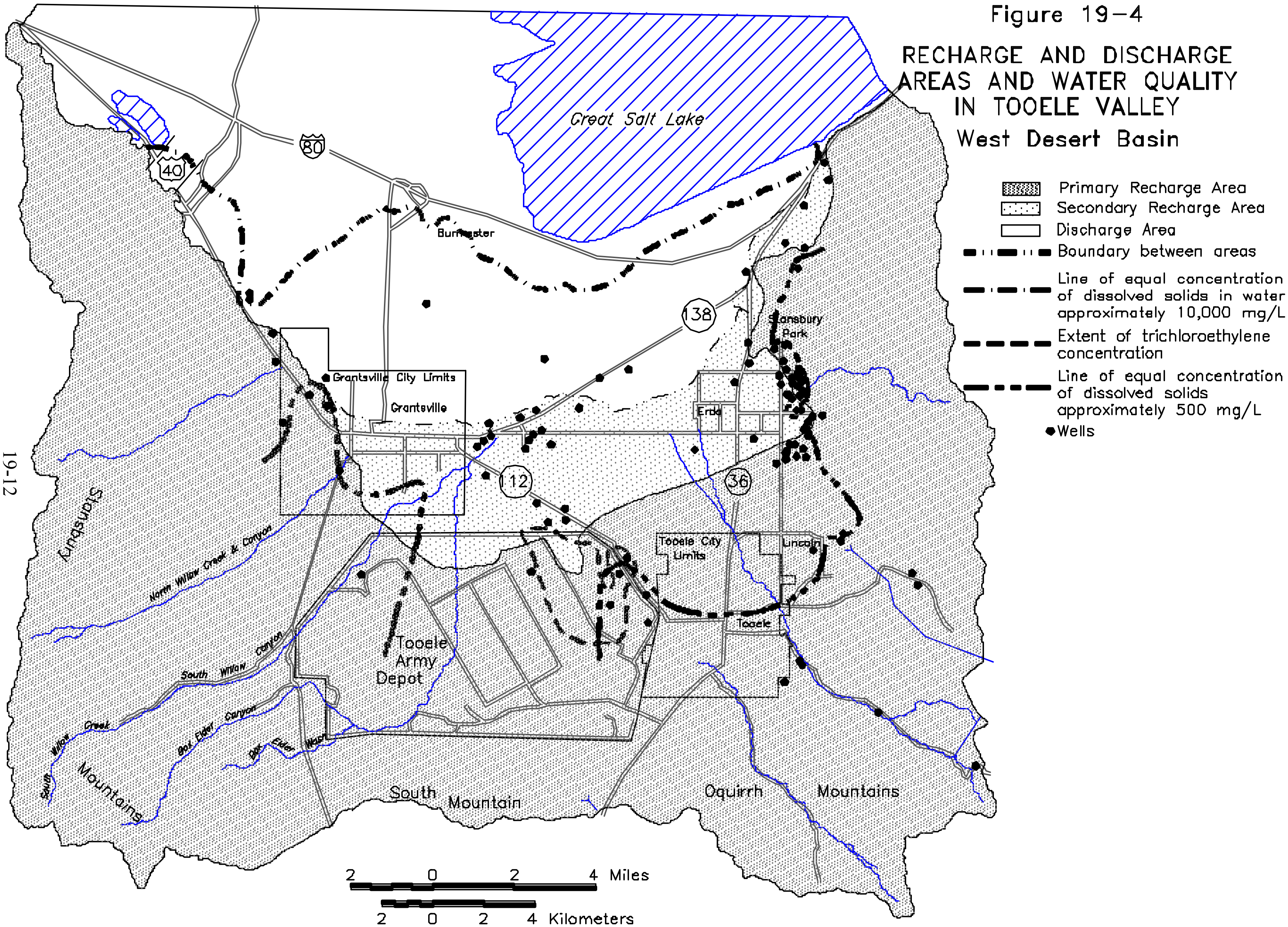
Figure 19-3

USGS
GROUNDWATER OBSERVATION WELLS
West Desert Basin

Figure 19-4

RECHARGE AND DISCHARGE AREAS AND WATER QUALITY IN TOOELE VALLEY

West Desert Basin



Section A

West Desert Basin

Utah State Water Plan

ACRONYMS, ABBREVIATIONS AND DEFINITIONS

A.1 ACRONYMS AND ABBREVIATIONS

Many names, titles, programs, organizations, legislative acts, measurements and activities are abbreviated to reduce the volume of words and to simplify communications. A few of the abbreviations and acronyms used in the West Desert Basin Plan are listed below.

A.1.1 State and Local Agencies and Organizations

CEM	Division of Comprehensive Emergency Management
CUWCD	Central Utah Water Conservancy District
DFFSL	Division of Forestry, Fire and State Lands
DWQ	Division of Water Quality
DWRe	Division of Water Resources
DWRi	Division of Water Rights
DPR	Division of Parks and Recreation
DDW	Division of Drinking Water
DNR	Department of Natural Resources
DEQ	Department of Environmental Quality
GOPB	Governor's Office of Planning and Budget
MCD	Multi-County Planning District
SDCO	State Disaster Coordinating Office
SHMT	State Hazard Mitigation Team
UWQB	Utah Water Quality Board

A.1.2 Federal Agencies

BLM	Bureau of Land Management
BR	Bureau of Reclamation
COE(Corps)	Corps of Engineers
EPA	Environmental Protection Agency
FSA	Farm Service Agency
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FWS(USFWS)	Fish and Wildlife Service
GS(USGS)	Geological Survey
NPS	National Parks Service
NRCS	Natural Resources Conservation Service
USDA	United States Department of Agriculture

A.1.3 Programs/Acts

ACP	Agricultural Conservation Program
CERCLA	Comprehensive Environmental Response and Comprehensive Liability Act
CFR	Code of Federal Regulations
CRP	Conservation Reserve Program
CWA	Clean Water Act
DWSPR	Drinking Water Source Protection Rule
ESA	Endangered Species Act
ECP	Emergency Conservation Program
EQIP	Environmental Quality Incentives Program
LWCF	Land and Water Conservation Fund
NAWQA	National Water Quality Assessment
NFIP	National Flood Insurance Program
NPDWR	National Primary Drinking Water Regulations
NPDES	National Pollution Discharge Elimination System
RPDWS	Rules for Public Drinking Water Systems
SCORP	State Comprehensive Outdoor Recreation Plan
SDWA	Safe Drinking Water Act
UPDES	Utah Pollution Discharge Elimination System
USDWA	Utah Safe Drinking Water Act
UWPCA	Utah Water Pollution Control Act
UWQA	Utah Water Quality Act
UWQB	Utah Water Quality Board

A.1.4 Measurements

ac-ft	Acre-feet
ac-ft/yr	Acre-feet per year
cfs	Cubic Feet Per Second
F°	Degrees Fahrenheit
gpcd	Gallons Per Capita Day
gpm	Gallons Per Minute
Kgal	1000 gallons
MCL	Maximum Contaminant Level
µmhos/cm	Micro mhos (unit of conductivity) per centimeter
mgd	Million Gallons Per Day
mg/l	Milligrams Per Liter
mW	Megawatt
PMP	Probable Maximum Precipitation
SMCL	Secondary Maximum Contaminant Level
TDS	Total Dissolved Solids

A.1.5 Miscellaneous

CWS	Community Water Systems
EAP	Emergency Action Plan
EOP	Emergency Operations Plan
FIRE	Finance, Insurance and Real Estate

GSL	Great Salt Lake
LDS Church	Church of Jesus Christ of Latter-day Saints
M&I	Municipal and Industrial
NCWS	Non-Community Water Systems
NTNCWS	Non-Transient Non-Community Water Systems
ORV	Off-Road Vehicle
PWS	Public Water Systems
RC&D	Resource Conservation and Development
RMP	Resource Management Plan
RPA	Reasonable and Prudent Alternative
TCPU	Transportation, Communications and Public Utilities
TNCWS	Transient Non-Community Water Systems.
UPED	Utah Process of Economic and Demographics
WET	Water Education for Teachers
WWTP	Wastewater Treatment Plant

A.2 WATER RESOURCE DEFINITIONS

Many terms used in the water business have different meanings in different contexts and are sometimes confusing. Some words are used interchangeably. A few commonly used water terms are defined for use in this document.

A.2.1 Water Use Terms

Water is often said to be *used* when it is diverted, withdrawn, depleted, or consumed. But it is also *used* in place for such things as fish and wildlife habitat, recreation and hydropower production.

Commercial Use - Uses normally associated with small business operations which may include drinking water, food preparation, personal sanitation, facility cleaning/maintenance and irrigation of landscapes.

Consumptive Use - Consumption of water for residential, commercial, institutional, industrial, agricultural, power generation and recreational purposes. Naturally occurring vegetation and wildlife also consumptively use water. Water consumed is not available for other uses within the system.

Depletion - Net loss of water through consumption, export and other uses to a given area, river system or basin. The terms *consumptive use* and *depletion*, often used interchangeably, are not always the same.

Diversion/Withdrawal - Water diverted from supply sources such as streams, lakes, reservoirs, springs or wells for a variety of uses, including cropland irrigation and residential, commercial, institutional and industrial purposes. The terms *diversion* and *withdrawal* are often used interchangeably.

Evapotranspiration - A combination of Evaporation, the transfer of water from the liquid to the vapor state, and Transpiration, the process by which plants remove moisture from the soil and release it to the air as vapor.

Industrial Use - Use associated with the manufacturing or assembly of products which may include the same basic uses as commercial business. The volume of water used by industrial businesses, however, can be considerably greater than water use by commercial businesses.

Institutional Use - Uses normally associated with general operation of various public agencies and institutions, including drinking water; personal sanitation; facility cleaning and maintenance; and irrigation of parks, cemeteries, playgrounds, recreational areas and other facilities.

Irrigation Use - Water diverted and applied to cropland. Residential lawn and garden uses are not included.

Municipal Use - This term is commonly used to include residential, commercial and institutional uses. It is sometimes used interchangeably with the term *public water use*.

Municipal and Industrial (M&I) Use - This term is used to include residential, commercial, institutional and industrial uses.

Private-Domestic Use - Includes water from private wells or springs for use in individual homes, usually in rural areas not accessible to public water supply systems.

Transient Noncommunity Water System (TNCWS) - A noncommunity public water system that does not serve 25 of the same nonresidential persons per day for more than six months per year. Examples of such systems are those serving a campground, RV park, diner or convenience store where the permanent nonresidential staff number less than 25, but the number of people served exceeds 25.

Residential Use - Water used for residential cooking; drinking; washing clothes; miscellaneous cleaning; personal grooming and sanitation; irrigation of lawns, gardens, and landscapes; and washing automobiles, driveways and other outside facilities.

A.2.2 Water Supply Terms

Water is supplied by a variety of systems for many uses. Most water supply systems are owned by an irrigation company or a municipality, but in some cases the owner/operator is a private company or a state or federal agency. Thus, a public water supply may be either publicly or privately owned. Systems may also supply treated or untreated water.

Municipal and Industrial (M&I) Water Supply - A supply that provides culinary/secondary water for residential, commercial, institutional or industrial uses.

Public Water System (PWS) - A system providing water for human consumption and other domestic uses, which has at least 15 service connections or serves an average of at least 25 individuals daily at least 60 days out of the year and includes collection, treatment, storage or distribution facilities under the control of the operator and is used primarily in connection with the system, or collection, pretreatment or storage facilities used primarily in connection with the system but not under his control (see 19-4-102 of the Utah Code Annotated). All public water systems are further categorized into three different types: Community (CWS), non-transient noncommunity (NTNCWS) and transient noncommunity (TNCWS) areas.

Secondary/Non-Potable Water Supply - Pressurized or open-ditch water supplies of untreated water for irrigation of privately or publicly owned lawns, gardens, parks, cemeteries, golf courses and other open areas. These are sometimes called dual water systems.

Noncommunity Water System (NCWS) - A public water system that is not a community water system. There are two types of NCWSs: Transient and non-transient.

Non-Transient Noncommunity Water System (NTNCWS) - A public water system regularly serving at least 25 of the same nonresidential persons per day for more than six months per year. Examples of such systems are those serving the same individuals (industrial workers, school children, church members) by means of a separate system.

A.2.3 Groundwater Terms
Aquifer - A saturated body of subsurface rock or soil which will yield water to wells or springs.

Groundwater - Water which is contained in the saturated portions of soil or rock beneath the land surface. Excludes soil moisture which refers to water held by capillary action in the upper unsaturated zones of soil or rock.

Phreatophyte - A plant species that extends its roots to the saturated zone under shallow water table conditions and transpires groundwater. These plants are high water users and include such species as tamarisk, greasewood, willows and cattails.

Recharge - Water added to the groundwater reservoir, or the process of adding water to the groundwater reservoir.

Recoverable Reserves - The amount of water reasonably recoverable from the groundwater reservoir with existing technology.

Safe Yield - The amount of water withdrawable from an aquifer on a long-term basis without serious quality, environmental or social consequences, or without depletion of the aquifer's groundwater.

Total Water in Storage - A volume of water derived by estimating the total volume of saturated aquifer in intergranular space containing water (total volume multiplied by porosity).

A.2.4 Other Water Terms
The following water terms have special significance in the water industry:

Call - The ability to order a quantity or flow of water at a given time and for a given period of time from a water supplier.

Carriage Water - The water used is a sanitary waste transport system of toilets, sewers, etc. The water need not be of drinking water quality.

Drinking Water - Water used for a potable/culinary supply.

Export Water - A man-made diversion of water from a river system or basin other than by the natural outflow of streams, rivers and groundwater. This is sometimes called a *transbasin diversion*.

Instream Flow - Water flow maintained in a stream for the preservation and propagation of wildlife or aquatic habitat and for aesthetic values.

Non-Point Source Pollution - Pollution discharged to lakes and streams over a wide land area, not from one specific location. This includes runoff of chemicals and fertilizer from agricultural land, animal waste runoff from feed lots, etc.

Point Source Pollution - Pollutants discharged from any identifiable point, including pipes, ditches, channels and containers.

Potable/Culinary - Water suitable for drinking or cooking purposes. The terms *culinary* and *potable* are often used interchangeably.

Reuse - The reclamation of water processed in a municipal or industrial wastewater treatment system.

Riparian Areas - Land areas adjacent to rivers, streams, springs, bogs, lakes and ponds. They are ecosystems composed of plant and animal species highly dependent on water.

Watershed - The total area of land above a given point on a waterway that contributes runoff water to the flow at that point; a drainage basin or a major subdivision of a drainage basin.

Wet/*Open Water Areas* - Includes lakes, ponds, reservoirs, streams, mud flats and other wet areas.

Wetlands - Areas where vegetation is associated with open water, wet and/or high water table conditions.

Water Yield - The runoff from precipitation that reaches water courses and, therefore, may be available for use.

Section B

West Desert Basin

Utah State Water Plan

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